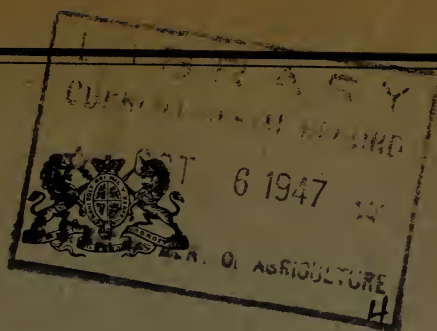


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PROCEEDINGS
OF THE
ROYAL SOCIETY
OF
QUEENSLAND
FOR 1945

VOL. LVII.

ISSUED 21st APRIL, 1947

PRICE: FIFTEEN SHILLINGS.

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Proceedings of the Royal Society of Queensland.

Presidential Address :

THE MOSQUITO PROBLEMS OF QUEENSLAND.

By F. A. PERKINS, B.Sc.Agr., Department of Biology, University of
Queensland.

(Delivered before the Royal Society of Queensland, 26th March, 1945.)

INTRODUCTION.

As retiring President, I should like to pay a tribute to the Hon. Secretary and the members of the Council for their assistance during the past year. As a general rule, the success achieved by a Society depends very largely on the enthusiasm and ability of the executive, and the Royal Society of Queensland is no exception to this rule.

During the year the death occurred of Dr. J. Lockhart Gibson, who first became a member of the Society in 1923. He was one of the leaders of the medical profession in Queensland and the author of many scientific papers and treatises. The support of a man so high in the medical profession was an asset to the Society, and his death is deeply regretted.

For many years the library of the Society has been housed in University buildings, and meetings held in University lecture rooms. In the near future, the University is to be removed to St. Lucia, and the present arrangement will no longer be in the best interests of the Society. Moreover, as the premier scientific Society in the State, it must start to make preparations for expansion after the war. The first essential is a permanent home for the library and a central meeting place. As usual, lack of money is the main obstacle in the way of such a development, an obstacle which will be difficult to overcome. The incoming council will be well advised to give this matter very earnest consideration. The accommodation problem within the University is rapidly approaching a critical state, and it is quite possible that in the very near future the Society will be asked at very short notice to make other arrangements to house its library. Suggestions the incoming Council might consider are:—(1) The establishment of a building fund; (2) a campaign to obtain financial assistance from members and other influential people in the community; and (3) requests to the State and Commonwealth Governments for aid.

It will take several years to make adequate provision for the future, and a start should be made at the earliest possible moment.

THE MOSQUITO PROBLEMS OF QUEENSLAND.

In the first place, it is necessary to draw attention to the title of this address. The plural is used deliberately, because in Queensland, and elsewhere, mosquitoes constitute not one, but several problems. One of the chief reasons why more has not been done to control mosquitoes in Queensland is the fact that they have been regarded as one big

problem. Anyone starting out to control all the mosquitoes in a large area is faced with an almost hopeless task requiring an expenditure of millions of pounds, an abundance of labour, and endless patience. The result is that such a campaign is rarely started, or soon discontinued. There are at least three distinct problems, each of which is caused by a separate complex of species, each affecting the community in a different way, and each requiring specialised methods of control. These three problems can be described as follows, and will be considered in detail—

- (a) The Domestic Mosquito Problem;
- (b) The Freshwater Mosquito Problem;
- (c) The Saltwater Mosquito Problem.

(a) THE DOMESTIC MOSQUITO PROBLEM.

The complex of mosquitoes responsible for this problem comprises those breeding in city and suburban areas, in and adjacent to dwellings. From the point of view of the majority of the people of Queensland, this is the most important problem of the three. It is associated with the spread of human diseases, and also with the existence of a very definite nuisance. There are two important species of mosquito responsible for this problem, and it is desirable and convenient to treat them separately.

Perhaps the more important of the two is the Dengue mosquito (*Aedes aegypti*). This cosmopolitan mosquito is well established throughout Queensland and is responsible for periodical epidemics of Dengue Fever. It is probably the most domesticated of all mosquitoes and appears to have a definite preference for human blood. As a rule it breeds only in vessels containing comparatively clean rain- or tap-water. Tanks, faulty guttering, old tins, vases, rubber tyres, &c., are the usual breeding places. Any artificial container capable of holding water for a week or more is likely to breed this mosquito. Although *Aedes aegypti*, which is essentially a day-biting mosquito, is a cause of real discomfort, it is considered first because it is the chief carrier of Dengue Fever, which has been all too common in Queensland during the last few years. Dengue Fever is not a fatal disease, except, perhaps, in the case of very young children, but it seriously affects the life and health of the community. During the last few years, probably aided by the war, it has been unusually prevalent; and unless a drastic change occurs in the attitude of the householder, it will continue to cause a great deal of loss of time and money. On the average a case of Dengue means two or three visits by a doctor, medicine, and usually about two weeks away from work. In one coastal town a firm engaged on war-work lost 27,000 man-days from Dengue alone at a time when both the firm and the country could ill afford the loss.

Control of Aedes aegypti.

The control of this mosquito is not difficult, and a determined effort by members of the community could obtain most satisfactory results in two to three years. As with all mosquito problems, under peace-time conditions *Aedes aegypti* can be controlled by the permanent elimination of all natural breeding-places. Perhaps the greatest single factor in the maintenance of this mosquito in our midst is the prevalence of large numbers of tanks not adequately protected from mosquitoes. During the war, when labour and materials are not available, there is some excuse for this state of affairs; but after the war, renovation of house-tanks should receive very early consideration. It is to be hoped

that in future the house-tank will not continue to be a feature of Queensland architecture. In many towns, tanks are still a regular feature, in spite of the fact that the town water-supply is quite soft enough for ordinary domestic purposes. When the town water is hard, water-softening, either at the source or in the home, will do away with the necessity for a tank. From the point of view of mosquito control this is most desirable; but it is also desirable for economic reasons, for the upkeep and frequent need for replacement involves a heavy drain on the house-owner. Also, tanks at their best are ugly, and the sooner their use is discontinued the better.

The other important domestic species is *Culex fatigans*, the common brown house mosquito. Like *Aedes aegypti*, it is found all over the world and is well established throughout Australia. *Culex fatigans* is a night-biter and throughout the summer is responsible for most of the mosquito worry in houses and other dwellings. During the early years of the war, in most of the camps in eastern Australia, this mosquito definitely affected the efficiency of the men, causing loss of sleep, worry and fatigue. Its nuisance is of more importance than its ability to carry disease. However, it is the chief vector of a disease known as Filariasis, which, according to a survey made in 1926, is rather common in the coastal towns of Queensland. In that survey, the average percentage of people infected with Filariasis was 12 per cent. Amongst the native population of many of the islands of the S.W. Pacific slightly more than 20 per cent. have been found to be infected with some form of Filariasis.

Culex fatigans is essentially a domestic species and breeds in polluted water in and adjacent to towns and villages. The common breeding-places are holes and gutters, and drains contaminated by the sullage water from the kitchen. In many country towns the main town sewer is run into a nearby creek, which becomes a permanent breeding-place, producing enough mosquitoes to infest the whole town area. Gully-traps, small domestic drains, and small holes and tins containing polluted water are all likely to breed this mosquito. It is most prolific, and in a suitable water a single random scoop with an ordinary soup ladle has yielded over 2,300 larvae.

Control of Culex fatigans.

Permanent control can only be achieved by the elimination of every breeding-place in the city and suburbs and for a radius of about three to four miles beyond the limits of the town area. It should be the responsibility of the ratepayer to eliminate all breeding-places on his own property. The Council or Shire should undertake the construction of water-channelling, the extension and control of the town sewer, and the elimination of all breeding-places on vacant unclaimed land.

Considering the domestic mosquito problem as a whole, the most essential requirement for its control is to educate the members of the community to realise their duty and obligation in the matter. Any town, provided the ratepayers have been taught what to do and why it is necessary, can eradicate the domestic mosquitoes in five years. It is the one problem which can be solved in a relatively short time. The weak point is the difficulty in educating the adult section of the community. Health inspectors can do a great deal, but they will have to be assisted by a very intensive campaign, making use of the press, radio, and other general means of propaganda. The campaign must be persevered with for a number of years.

More success will probably be obtained by concentrating on school children, and such a campaign has already commenced. The school child

learns more quickly, is more capable of receiving new ideas, and if he develops the right attitude on mosquito control in his school days, that attitude is likely to persist throughout his adult life. It is quite possible that the ratepayer will be influenced more by his children than by direct methods.

(b) THE FRESHWATER MOSQUITO PROBLEM.

Included in this problem are all the mosquitoes breeding in fresh water other than the domestic species. Quite a variety of breeding-places is involved, including small creeks, lagoons, swamps, rock-pools and tree-holes. Of the 80-100 species of mosquitoes breeding in fresh water, only five species can be considered as important. The other species bite occasionally but are not sufficiently numerous to warrant control measures. The important species are as follows:—

1. *Anopheles annulipes*. This mosquito is found in all parts of Australia and usually breeds in fresh, clean water containing aquatic vegetation and exposed to sunlight. At times, it occurs in very large numbers and bites viciously out of doors at dusk and for a few hours afterwards. This species is an efficient vector of malaria and is probably responsible for most of the cases of malaria contracted south of Cairns.

2. *Anopheles punctulatus*. This species occurs in North Queensland, the southern limit being about Ingham. It breeds in a wide range of breeding-places, particularly in man-made parts, such as wheel-ruts, borrow-pits and other small excavations. It can also breed in brackish pools exposed to sunlight. The adult mosquito readily enters dwellings and bites from dusk to dawn. As a general rule it does not remain indoors very long after it has taken a blood meal.

This species and its close relatives are the most efficient carriers of malaria in the S.W. Pacific and it was responsible for the epidemics in Cairns (1942) and New Guinea. The fact that it appears to show some preference for seeking a blood meal indoors is possibly the main reason why it is more important as a carrier of malaria than *Anopheles annulipes*.

3. The third species in this complex is *Culex annulirostris*. It is a very common mosquito out of doors throughout Eastern Australia, but not as a rule found in large numbers indoors. It becomes very active at dusk and continues to bite viciously throughout the night. This species breeds in freshwater creeks, lagoons and in any clean water containing an abundance of vegetation. Usually it is associated with *Anopheles annulipes*. Sometimes, where a large freshwater creek or swamp occurs close to dwellings, this mosquito can almost be regarded as a domestic species and under such conditions is associated with *Culex fatigans*. It is not considered that *Culex annulirostris* plays any important role in the spread of disease; but it may be a real nuisance in urban and suburban areas.

4. Two other species sometimes occurring in large numbers in Queensland are *Mansonia uniformis* and *Mansonia xanthogaster*. Both these species occur in fresh water containing aquatic vegetation, and their larvae are noted for their peculiar habit of remaining attached to the roots of aquatic plants for long periods. The siphon of the larva is inserted into the root and the larva is able to tap the air contained in the root, and at the same time is free to obtain food from the water. The adults of these species are vicious biters day and night, both in and out of dwellings. *Mansonia xanthogaster* is a smooth blood-red mosquito, the conspicuous colour attracting attention whenever it is prevalent.

Mansonia uniformis is known to be an efficient carrier of *Filaria* spp. and consequently is of some medical importance.

Control of Freshwater Species.

With regard to the control of these freshwater species, the problem is divided into two distinct parts—(a) In the neighbourhood of Cairns and further north, where *Anopheles punctulatus* is endemic, every endeavour will have to be made to keep this species in check to eliminate the possibility of epidemics of malaria. It is to be hoped that arrangements will be made to retain permanently one or two of the Army Malaria Control Units. If such a course is adopted, malaria will be kept in check in the only bad area in Queensland, a very satisfactory training organisation will be maintained for anti-malarial work, and trained personnel will be available immediately in the event of another war. (b) South of Cairns, control of freshwater mosquitoes is not justified. To attempt such a task would require the expenditure of millions of pounds, and their importance does not warrant such an outlay. None of the freshwater species are important vectors of disease and the nuisance they create, except on the fringe of larger towns or in country villages, is not sufficiently great to need elaborate control measures.

(c) THE SALTWATER PROBLEM.

This problem is easily the biggest of the three and its solution most difficult and costly. Several species are considered to be saltwater species, but the following are the most important:—

(1) *Aedes vigilax*. This exceedingly common species is found throughout the coastal areas of Queensland. It breeds in countless millions in the salt and brackish water swamps which are only too common on our coast. The shallow swampy areas behind the mangroves, particularly where, for some reason or other, fish are prevented from gaining access to the swamp, are the usual breeding-place of this mosquito. The adults appear to fly or be carried by winds into the coastal towns, and occur in such large numbers as to make life unbearable. To give some idea of the abundance of this species, it can now be stated that it was frequently used in experiments to test mosquito repellents. In such experiments biting frequencies of over 200 a minute were quite common. Although it frequently bites indoors, the usual habitat is out of doors, particularly in gardens and similar situations, where it bites viciously day and night. *Aedes vigilax* is not considered to be very important as a carrier of disease, but it is a very great nuisance, and eventually the permanent control of this species will have to be attempted.

(2) *Culex sitiens*. This mosquito is usually found associated with *Aedes vigilax*, but does not occur in such large numbers. The habits of both larvae and adult are similar to those of *Aedes vigilax*, and again it is important because of its nuisance effect and not because of its relation to disease.

(3) *Mucicus alternans*. Well known to all Queenslanders as the "Scotch Grey", this mosquito is usually associated with *Aedes vigilax* and *Culex sitiens*. The larvae of *Mucicus alternans* are predaceous and usually feed on the larvae of *Aedes vigilax* and similar species. The mosquito itself is a large brown and white mosquito, the extraordinary size invariably creating a great impression on the person being bitten. Actually the pain of the bite is not as sharp as that of *Aedes vigilax*, a much smaller mosquito.

(4) *Anopheles amictus*. This species appears to take the place of *Anopheles annulipes*, which is not often found in brackish water.

Anopheles amictus is known to be capable of transmitting malaria; but except perhaps in the far north it is unlikely to play any great part in initiating or maintaining an epidemic. It is also capable of acting as a vector of *Wuchereria bancrofti* (the cause of Filariasis) and consequently is of potential, if not actual, medical importance.

Control of Saltwater Species.

The control of the saltwater species mentioned above is a very big and difficult problem. At a conservative estimate approximately 3,000 square miles of breeding-grounds exist along the coast of Queensland. To obtain satisfactory results, breeding must be eliminated permanently; and the only efficient method of doing this is by a well-designed series of drains and ditches accompanied by levelling and filling where required. The cost of such an undertaking is very difficult to estimate, but it would certainly amount to several thousand pounds per square mile. Any attempt to control the saltwater mosquitoes throughout Queensland is quite out of the question, but in a limited number of small selected areas a beginning should be made. To the east of most of the larger coastal towns breeding areas exist, and these are responsible for most of the nuisance caused by the saltwater mosquitoes. It is quite feasible and desirable for control work to be initiated in these areas, and although noticeable results will not be obtained for some years, such work is well worthwhile. Eventually the small controlled areas would be linked up, and in the distant future some degree of permanent control may be achieved.

On this saltwater problem, it is essential for the community to develop a long-range view and to be prepared to meet the expense of control measures, the results of which will not become apparent for many years. Only permanent control measures should be carried out and any attempt to undertake temporary control by weekly spraying or other such methods should not be allowed. Temporary control is inefficient and, in the long run, uneconomical. While on this point it is probably wise to comment on the publicity given to D.D.T. in the press recently. While D.D.T. has given excellent service under Army conditions, its use for peace-time control is definitely limited. In the prevention of mosquito breeding, D.D.T. can only be used as a temporary measure of control, and has the same disadvantages as all other temporary measures.

It is hoped that the above brief summary has made it quite clear that there are at least three distinct mosquito problems. The most important is the domestic problem, because of its association with serious mosquito-borne diseases. Fortunately there is no reason why it should not be solved in a few years provided the ratepayers, local authorities and citizens co-operate and support a determined and sustained campaign.

The freshwater problem, although big, is comparatively unimportant, and at present does not warrant any time or expense being devoted to it.

The saltwater problem is a very big one and we must realise that its solution will not come in our time. An attempt should be made to start a control campaign which will bring results in the distant future. Unfortunately, the citizen who does not understand that there are three problems is discouraged by the presence of saltwater mosquitoes and will not give his support to the control of the domestic species, which affect his health and comfort to a much greater extent than the saltwater species. Only a long-sustained educational campaign can correct this state of affairs.

A MARINE EARLY CRETACEOUS FAUNA FROM STANWELL (ROCKHAMPTON DISTRICT).

BY F. W. WHITEHOUSE, Ph.D., D.Sc. (Lt.-Col., R.A.E.).
Department of Geology, University of Queensland.

Received March 12th, 1945; tabled before the Society 27th August, 1945;
issued separately, 9th October, 1946.

(PLATE 1).

Summary.—A small molluscan fauna of early Cretaceous age is described from a bed at Stanwell that apparently is within the Stanwell Coal Measures. The fauna is typical of the Valanginian (?) *Trigonia* beds of the Indo-Pacific region and, with other evidence, makes the Lower Cretaceous history of Eastern Australia closely parallel with that of India and of East and South Africa. From this evidence it would appear that the Stanwell Coal Measures may be later than has been thought—equivalent to the Blythesdale (pre-Aptian Cretaceous) and not Walloon (mid to late Jurassic) Series. This is not at variance with the floral evidence.

Some years ago Mr. J. H. Reid, District Geologist for Central Queensland, discovered marine mollusca on Portions 128 and 129, Parish of Stanwell, a locality about 20 miles W.S.W. of Rockhampton. There were many fragments, but few good specimens, preserved in a hard, brownish, calcareous sandstone.

Quite apart from its local importance in being evidence of marine Cretaceous conditions in a region far removed from other such beds, the collection is of unusual general interest in being the first record in Australia of a fauna, widespread in Indo-Pacific regions, that has given rise in recent times to a considerable controversy. Three questions arise: What precisely is the age of the fauna; how are the beds related locally to other sedimentary series; and what are the general palaeogeographical and stratigraphical relations to the Indo-Pacific region at large?

THE AGE OF THE FAUNA.

The decisive elements of the fauna are *Iotrigonia limatula* and *Pisotrigonia* sp. These are members of a fauna rich in peculiar Trigonias, that occurs only in the Indo-Pacific region. The trigoniid genera have not been recognised in Europe. The *Pisotrigonia* at this locality, although it has been collected only in fragments, is quite typical. Trigonias with V-shaped ribbing, as is noted below, appear at several horizons in the Jurassic and Cretaceous; but the type of V-ribbing in *I. limatula* is not known in any group other than that of *Iotrigonia*. Other features of the test agree, so that this assemblage may be correlated confidently with the *Iotrigonia* and *Pisotrigonia* faunas of the Uitenhage and Oomia beds.

The other elements of the fauna, although giving no precise evidence of age, are of groups that are found or may be found in those faunas. *Pseudomonotis* and *Hibolites* begin well down in the Jurassic and last until the Aptian. *Panope* is essentially Cretaceous; but it is very similar to Jurassic and Cretaceous *Pleuromya* and details of the hinge that distinguish the two genera are not shown in these specimens. *Indotrigonia* is another element of the *Iotrigonia* faunas in Kachh and East

Africa. However there is no certainty that the imperfectly preserved form now figured as *I. (?) sp.* is a true member of the genus; so that the record, being indefinite, does not confirm the evidence of the two other *Trigonias* in the collection although it does not oppose it.

This fauna, then, may be regarded as equivalent to that of the Uitenhage and Oomia beds. It gives no new evidence about the age of those faunas; but the evidence that they give may be used in placing the Stanwell bed.

The previous palaeontological evidence has been presented in great detail by Kitchin, particularly in his last papers (1926 and 1929). In one region this fauna is known definitely to be of Valanginian age—the Uitenhage beds, with a decisive ammonite fauna. In Patagonia, elements of the fauna are found with Neocomian ammonites; though it has not been made clear at present to which division of the Neocomian they belong. At other localities they are known to be pre-Aptian or post-Upper Jurassic, or both. At Kachh, for instance (see Spath 1930, p. 137), the sequence is as follows:—

Ukra Hill beds (with Aptian ammonites).	
Sandstones—several hundred feet thick.	} Oomia beds.
<i>Trigonia</i> bed.	
Sandstones—several hundred feet thick.	
Dhosa Oolite (with Lower Tithonian ammonites).	

In Zululand the fauna occurs at some unstated distance below beds with Aptian ammonites. At Tendaguru, as Kitchin has shown, the beds with indigenous *Trigonias* are pre-Aptian and occur with apparently *derived* Kimmeridgian ammonites.

In the Malone formation of Texas, elements of this fauna occur. Kimmeridgian ammonites are present (like Tendaguru) but the lamelli-branches are of Cretaceous facies (Kitchin 1926). Kitchin has suggested that here, and in Tendaguru, there is an admixture of endemic and derived fossils.

These faunas are, at the earliest, late Jurassic (Kimmeridgian) and are pre-Aptian. With Kitchin, one may agree that they are so similar as to form a stratigraphical unit; and since they are known to be Valanginian in South Africa, a Valanginian or near-Valanginian age may be assumed provisionally for the fauna.

A marine Hauterivian horizon (with *Simbirskites*) is recorded with some doubt¹ from elsewhere in Queensland (near Morven) where, as at Stanwell, the bed would occur within a pre-Aptian lacustrine

¹ The history of this record is as follows:—In the collections of the Queensland Museum a group of five fossils, cemented with commercial cement, bears the locality label "Victoria Downs, Morven". The exhibit has been in the Museum for several decades, but there is no record of how acquired. The ammonites (see Whitehouse 1927, p. 111) are typically Hauterivian. The other shells are a species of *Leptomaria*. No further material has been brought in from this region.

Victoria Downs was a property of some 200 square miles in area on which richly fossiliferous Aptian beds with ammonites (Roma Series) are underlain conformably by lacustrine beds (Blythesdale Series). It is thus a likely locality.

In preservation the specimens are so like the *Simbirskites* from North Germany, and specific relations are so close with North Germany forms, as Etheridge (1909) noted, that a little uneasiness is felt about the locality record. No geologist yet has searched the property for pre-Aptian fossils.

series. If the record should prove correct, the possibility must be considered that these two faunas are equivalent—whereupon the *Iotrigonia* faunas might persist to the Hauterivian. But not only is the Morven record doubtful but no species or genera are common to the two very meagre collections. Thus for the present it is advisable to conclude that the *Iotrigonia* fauna is Valanginian (or near-Valanginian), but that at least one other Neocomian marine incursion may have taken place into the pre-Aptian lacustrine area of Queensland.

LOCAL ASPECTS.

Mr. Reid states that the bed with the fossils is apparently not more than one foot in thickness and is interbedded in sandstones that are presumed to be part of the Mesozoic sediments of the Stanwell coal basin; and that the locality is but 100 feet from the prominent east-west "Stanwell fault" where the Mesozoic beds to the south are vertical and in juxtaposition with andesites of the Lower Bowen (Permian) volcanics to the north.

The rocks of the Stanwell area have been described by Dunstan (1898). The major portions of the sediments, covering an area of approximately 70 square miles, are sandstones, shales and coals of the Stanwell Coal Measures. They have a minimum thickness of 700 feet and have yielded the following flora² which Walkom has determined to be of Jurassic age:

Equisetites cf. *rajmahalensis* O. and M.

Taeniopteris spatulata McClell.

T. spatulata var. *major* Seward.

T. crassinervis (Feist.) Walkom.

T. tenison-woodsii (Eth. fil.) Dun.

Phyllopteris feistmantelii Eth. fil.

Ptilophyllum pecten (Phillips) Seward.

Araucarites polycarpa (Ten.-Woods) Walkom.

Elatocladus planus (Feist.) Walkom.

Apart from the region beside the fault, the Mesozoic beds in this basin are horizontal or very slightly dipping, dips not exceeding 10°.

Dunstan also records horizontal "Desert Sandstone" beds lying unconformably on the Stanwell Coal Measures though none are shown in his map near the new fossil locality. The lithology of the Desert Sandstone was not discussed. A passing reference stated that it is ferruginous. Unfortunately, the term "Desert Sandstone" has been used in Queensland for a great variety of material, including, more commonly than anything else, remnant of old lateritic soils. The reference to the ferruginous nature of the "Desert Sandstone" suggests that these also may be lateritic remnants.

It is not likely that the fossiliferous bed is part of the "Desert Sandstone." The hard, highly calcareous, brown sandstone is very typical of Mesozoic series of sundry ages in Queensland and quite unlike anything that any worker has placed in the "Desert Sandstone." As Reid has indicated in an unpublished communication, it is probable that the sediments are part of the Stanwell Coal Measures.

² Determinations by Walkom in his papers of 1915 and 1917.

If that is so and the age of the bed be accepted as lower Cretaceous, what then is the age of these coal measures generally? It may be pointed out that of the nine species of fossil plants mentioned above, upon which Walkom based a Jurassic age for the Series, no less than six are long-ranged forms—occurring not only in definitely Jurassic beds but described also by Walkom (1918 and 1919) in beds of unquestionably Cretaceous age elsewhere in Queensland³. The three exceptions are *Taeniopteris spatulata* var. *major*, *Phyllopteris feistmantelii* and *Taeniopteris crassinervis*. Of these the first is merely a variety of a species that occurs both in the Stanwell flora and in the Cretaceous floras described by Walkom. Then it should be noted that Walkom (1919, p. 23), when describing *Phyllopteris lanceolata* from the Cretaceous rocks of the Burrum Series, stated that “it is possible that *P. lanceolata* is a later, modified form of *P. feistmantelii*.”

Thus there is nothing against either of these two species being of Lower Cretaceous age. There remains *Taeniopteris crassinervis*. *Taeniopteris* is of course a form-genus, but nevertheless, as such, ranges from Permian to Lower Cretaceous. Forms that are identified in Queensland as of this species belong to at least three natural genera (including *Yabeiella*). Apart from this one record all the macrotaeniopterids in Queensland are from beds of early Triassic age—the Esk Series and the early part of the Ipswich Series. They are not known locally in beds that are undoubtedly Jurassic.

Species, like the Stanwell species, with infrequent dichotomous branching of the veins, occur in both Jurassic and Cretaceous beds elsewhere (*e.g.*, the lower Cretaceous beds of the Weald in England and of Maryland in North America). Only its size makes it unusual for a Cretaceous form—it reaches a diameter of five inches. I know of no other Cretaceous *Taeniopteris* more than two inches wide—larger forms that have been recorded in Cretaceous rocks as *Taeniopteris* (or *Macrotaeniopteris*) are usually *Nilssonia*.

In the nature of such evidence there is little against the flora being of Lower Cretaceous age; and accordingly it is suggested that these Coal Measures generally are early Cretaceous—of Valanginian or near-Valanginian age. That is, in the local record, they may be regarded as approximate equivalents of the upper part of the Tiaro Series and of the Blythesdale Series generally, both of which lie below beds with Aptian ammonites.

PALAEOGEOGRAPHICAL ASPECTS.

Lower Cretaceous marine beds now are known at two localities⁴ along the east coast of Queensland—in the Maryborough-Bundaberg region where Lower Aptian marine beds interrupt a succession of Coal Measures; and here at Stanwell where Valanginian (?) beds also apparently are within a coal measure sequence.

The general geological history of the Lower Cretaceous of Queensland now becomes markedly similar to that of South and East Africa and of India. In all these regions the earliest Cretaceous sediments are

³ The latter plants came from the Maryborough Series where they are interbedded in marine shales with Aptian ammonites (*Australiceras*); from the Burrum Series that overlies the Maryborough Series; and from the Styx River Series that has, in addition, dicotyledonous plants.

⁴ That is, excluding remnants in Cape York Peninsula in the far north of Queensland.

lacustrine beds, chiefly sandstones, in which Valanginian (?) beds with the *Iotrionia* fauna are a transient marine phase. Then follow marine Aptian sediments and then, after an interval, marine Upper Albian. The possibility of a marine Hauterivian incursion in Queensland raises the question whether other transient Neocomian marine phases may be present.

Such is the similarity of succession. There is also a similarity of faunas. The faunal agreement throughout this province of the first marine phase has been noted. Although the relationships are most marked with India and Africa, representatives of this limited *Trigonia* assembly are known in the N.W. Himalayas, Kachh, Coconda (east coast of India), Madagascar, Tanganyika, Zululand, South Africa, as well as in Patagonia, Chile, Bolivia and Texas. The similarity continues. Little is known at present of the Aptian faunas of Africa and India; but records from Zululand by Rennie (1936) of *Toxoceratoides*, *Australiceras*, *Tropaeum arcticum*, etc., suggest that there may be a close comparison with the Aptian beds (Roma Series) of Queensland.

In the Upper Albian the faunal similarities between East Africa and Eastern Australia are particularly marked, as Spath (1925) and I (Whitehouse, 1926) have shown. Several of the ammonite genera are common to those regions and are known nowhere else.

As a further link, reference may be made again to the belemnite family Dimitobelidae (Whitehouse, 1924) which is restricted to the Indo-Pacific region (India, Australia and New Zealand), and to the genus *Maccoyella* (chiefly Aptian), restricted, so far as is known, to India, Australia, New Zealand and Patagonia.

Pacific relationships remain intimate in the Upper Cretaceous, as Wilckens frequently has stressed (see, e.g., 1922, p. 31), but now they are more evident in the eastern Pacific region. No Upper Cretaceous marine beds occur in Queensland.

In these things this zone differs from the East Indies province. There, for instance, Valanginian beds are known (in Borneo and Sumatra) but they are of foraminiferal facies and have not yielded the *Iotrionia* fauna. Later Cretaceous faunas of the Indies also are markedly different in facies—e.g., Albian deposits have pseudoceratitic ammonites.

FOSSIL PLANTS.

This is not the occasion to review in detail the palaeobotanical evidence of the Lower Cretaceous of Queensland; but a few aspects should be noted.

The typical early Mesozoic gymnosperm flora, with *Taeniopteris*, *Ginkgoites*, *Cladophlebis*, *Thinnfeldia*, etc., begins in Gondwanaland in the Permian. These four "genera," for instance, occur in the Permian of Queensland. Throughout the whole of the Triassic period the flora flourished and reached its local acme. It declined markedly in the Jurassic of Queensland where only occasionally is there a flora rich in species.

This flora was not well established in Europe until late in the Triassic—which accounts for so many of the Queensland Triassic floras having been placed erroneously as Rhaetic from European comparisons.

Typical Cretaceous gymnosperms, like *Nathorstia*, are spasmodically present in the Queensland floras. In the very far north, at Plutoville (see Walkom 1928), they are abundant in pre-Aptian beds but are rare in the south. They are not present in the Aptian flora of the Maryborough Series and are very sparingly present in the post-Aptian Burrum Series. Some of the typical, abundant plants of the Northern Hemisphere, notably the Cycadeoidea, did not reach Australia. This suggests that the early Mesozoic-type flora (*Thinnfeldia* Flora) evolved in the Permian of Gondwanaland and spread late in the Triassic to Europe; while in contrast the later (Cretaceous) gymnosperm flora arose in the northern regions and spread south.

Generally, in the Lower Cretaceous floras of the southern areas of Queensland, gymnosperms of types that dominated the Jurassic are still overwhelmingly the dominant forms. Thus, if the Stanwell Series, on the evidence of the mollusca, is very early Cretaceous, it is not altogether surprising that all the forms so far found are of the early gymnosperm types.

DESCRIPTION OF SPECIES.

(From material in the collections of the Geological Survey of Queensland.)

Genus *IOTRIGONIA* van Hoepen 1929B.

(Genotype by original designation: *Iotrigonia crassitesta* van Hoepen, p. 7, pl. II, figs. 4, 5; pl. III, figs. 1, 2. Lower Cretaceous Ndbana beds, Umsinene River, Zululand.)

Trigonias with V-shaped ribbing on the disc have appeared on several occasions. A middle Jurassic group was separated as *Vaugonia* by Crickmay in 1932 (Type: *V. veronica* Crickmay), and another of Lower Cretaceous age was named *Iotrigonia* by van Hoepen in 1929. No other groups have been given generic recognition. These two are but partial homoeomorphs, the ornament on disc and area differing considerably in the two groups. V-shaped ribbing arises in each group by a marked angularity developing between the anterior and posterior parts of the ribbing on the disc in the late nepionic or neanic stage, and this becomes exaggerated quickly into an acute angle forming a V. It may be regarded as the limiting stage of a tendency which in other groups of Trigonias (e.g., *Trigonia diversicostata* Whiteaves, 1876, p. 68, pl. X, fig. 1) is halted when the angularity does not exceed a right angle. In *Iotrigonia* the tendency is more developed than in *Vaugonia*, the angularity of the ribs being markedly more acute, reaching its acme in *I. limatula*. It may even be, as Kitchin has suggested in dealing with *I. vau* and *I. v-scripta*, that the genus is not strictly monophyletic.

Dietrich (1933, p. 33) has dealt briefly with the similarities of the two genera, and Rennie (1936, p. 338) has discussed at length the genus *Iotrigonia*. Reference should be made to two papers by Kitchin (1903, p. 70 and 1908, p. 110) written long before the generic name was given, in which the relationships and affinities of the group of species now separated as *Iotrigonia* were discussed in admirable detail.

Hitherto *Iotrigonia* has been recognised with complete certainty only in India and South Africa. The valid species of the genus⁵ include *I. vau* (Sharpe) and *I. stowi* (Kitchin) from the Uitenhage beds of South Africa; *I. crassitesta* van Hoepen, *I. inconstans* van Hoepen and *I. haughtoni* Rennie from Zululand; and *I. v-scripta* (Kitchin) and, doubtfully, *I. dubia* (Kitchin) from the Oomia beds of Kachh in India. Kitchin refers to *Trigonia kühni* Müller from Neocomian beds in Tanganyika as possibly related. I have not seen Müller's work.

Of the American early Cretaceous species to which attention was drawn by Kitchin, *Trigonia diversicostata* Whiteaves, from Queen Charlotte Islands, and *Trigonia heterosculpta* Stanton from Patagonia are, I think, generically distinct. They and certain forms from the Malone Formation in Texas (Cragin, 1905, pl. LX, figs. 4-6) give more the appearance that V-ribbing developed as a sudden late acquisition, and it never assumes the perfect V of the Indian and African species. Chilean forms described by Phillipi (*T. arsinoe* P. and *T. foveata* P.) and an Alaskan species (*T. doroschini* Eichwald) also are mentioned by Kitchin, though he does not stress close relationships. I have not seen these two works.

The vertical ranges of *Iotrigonia*, from the African and Indian records, is a little difficult to assess. Spath's monograph on the ammonites (1930) establishes definitely that the age of the Uitenhage species is Valanginian. Of the Zululand forms *I. crassitesta* and *I. inconstans* occur in the Ndabana beds which lie below the ammonite-rich Umsinene beds of Albian age. Van Hoepen (1929A, p. 10) refers them to the Aptian, but the evidence for this is not yet published—the only ammonite in his list is *Douvilleiceras* sp., presumably *Douvilleiceras* in a comprehensive sense. As Rennie points out, all the Ndabana *Trigonia*s are closely akin to Uitenhage species. *I. haughtoni* from Northern Zululand was found below a horizon with an Aptian ammonite (*Tropaeum* sp.); but whether it is Aptian or pre-Aptian remains to be proved.

Similarly in Kachh, in India, the evidence is not precise. The species of *Iotrigonia* are from the Oomia group, the *Trigonia* bed occurring above the zone with Tithonian ammonites and below the beds with Aptian ammonites (see Spath's analysis of the succession—1933, pp. 736-757). Thus there the genus may be of late Tithonian or some pre-Aptian Cretaceous age. Once again the resemblance of associated *Trigonia*s to Uitenhage species has been noted by Kitchin and others.

Thus at present all that can be stated without question about the range of *Iotrigonia* is that it is not known earlier than Kimmeridgian or later than lower Aptian. But there is reason to believe that it may be confined to beds of Valanginian or near-Valanginian age. It is

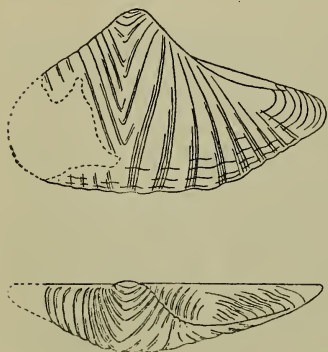
⁵ Bibliographic references to these and other species mentioned are as follows:—*I. vau*: Sharpe 1856, p. 194, pl. XXII, fig. 5, redescribed by Kitchin 1908, p. 110, pl. VI, figs. 1-3. *I. stowi*: Kitchin 1908, p. 115, pls. VI, figs. 4, 5; VII, fig. 1, *I. crassitesta*: van Hoepen 1929B, p. 7, pls. II, figs. 4, 5; III, figs. 1, 2. *I. inconstans*: van Hoepen 1929B, p. 8, pls. III, figs. 3, 4; IV, figs. 1, 2. *I. haughtoni*: Rennie 1936, p. 340, pl. XLI, figs. 1-4. *I. v-scripta*: Kitchin 1903, p. 70, pls. VII, figs. 6-8; VIII, figs. 1-3. *I. dubia*: Kitchin 1903, p. 67, pl. VII, figs. 3-5. *Trigonia diversicostata*: Whiteaves 1876, p. 68, pl. IX, fig. 1. *Trigonia heterosculpta*: Stanton 1901, p. 20, pl. IV, figs. 16-18.

pertinent to remark that the marine Aptian beds (Roma Series) of Queensland contain an assembly of Trigonias, mostly undescribed, but none of the genera of this faunule.

I. crassitesta, *I. inconstans* and *I. v-scripta* all have a gerontic stage in which the V-ribbing ceases and purely concentric rugae succeed. This, of course, is not peculiar to *Iotrigonia*. Also, as in other Trigonias, in the gerontic stage, the marginal carina and the area tend to smoothen. In the nepionic stage the ribbing is concentric; and an intensification of gerontic tendencies with progressive limitation of the normal adult V-ribbing would lead to simple, concentrically ornamented forms. Such purely concentrically marked genera as *Indotrigonia*, *Sphenotrigonia* and *Rutitrigonia* are no doubt end-points of such a tendency in more than one lineage of Trigonias.

IOTRIGONIA LIMATULA sp. nov. Pl. I, figs. 1a, b.

Diagnosis: Sharply triangular *Iotrigonia* with very regular V-shaped ribs meeting at an acute angle along a straight axis and with a sharp marginal carina and narrow cardinal area.



Description: Shell thin, evenly but only slightly inflated, considerably longer than high. Outline sharply triangular, modified by a well rounded antero-ventral angle and a slight rounding of the acute postero-ventral corner. The umbo, which is very sharply defined and incurved, is slightly anterior to the median line (at almost one-third of the transverse diameter). Marginal carina very sharp in the earlier growth stages (to 16 mm.), abruptly bounding a very narrow lunate and slightly concave cardinal area.

On the disc the first few costae are concentric, gradually assuming a V-shape. Then they become V-shaped, the two branches forming a rib converging at a very acute angle. Occasionally an anterior rib ceases at the V-axis and is not paired on the posterior side.

The axis of the V's is remarkably straight and at right angles to the major axis of the shell. Costae are broadly rounded and spaced with narrower sulci. The posterior region being somewhat wider than the anterior, the costae become wider in that direction and cease just before the posterior angle. In the first 16 mm. of the marginal carina, where it is very sharp, each costa of the disc reappears as a costa of the area, extending slightly obliquely to the cardinal margin. Then, when the marginal carina broadens, the area becomes smooth and develops a faint longitudinal sulcus. The escutcheon is so narrow as to be obsolescent. Both disc and area are marked also with faint growth striae.

Internal structures not known.

Dimensions of holotype: Length: 36 mm. Height: 24 mm. Thickness: 7 mm. (Single valve.)

Along the main axis the relationship of the region in front of the V-axis to that of the region behind it is precisely 1 : 2.

Remarks: Only one specimen, the holotype, has been collected. It is a relatively small form for the genus and thereby possibly is immature.

In comparing it with other species, particularly the younger stages of other species, attention is drawn to the thinness of the shell in this form; to its sharply triangular outline and very sharp marginal carina in its early stage; to the very acute V-ribbing and the straightness of the V-axis. In such features it is in sharp contrast with such forms as *I. crassitesta* van Hoepen and *I. inconstans* van Hoepen with thick tests and less incisive details of form. It is to *I. v-scripta* that it shows most resemblances. Some smaller specimens of that species figured by Kitchin (1903, pl. VIII, figs. 1, 2) are very comparable, being similarly compressed and having also a more strictly scalene outline and a sharp marginal carina, while the ornament of the cardinal area also generally agrees. The two, although close, are not con-specific; for in *T. v-scripta* the V-axis is slightly curved and there is a median carina also on the area. The development of the costae in the early stages of these two species is rather similar. *T. haughtoni*, although thicker and more inflated, also may be compared for its relatively incisive details in the early stages and in the development of the early costae. But there the V-ribs although more acute than the genotype are developed along an axis with a very marked curvature.

The holotype of *I. limatula* has no suggestion of gerontic characters. Indeed in the preciseness of shape, details of ribbing and the sharpness of carina, it has a particularly youthful appearance. Whether larger specimens will show a cessation of the V-ribs in the very last stage remains to be proved. It is not to be concluded, of course, that apparently youthful characters indicate an early species of the genus. Spath (1935, p. 185) rightly has pointed out that arguments about age based purely on the apparent stage of evolutionary development within a group of Trigonias are apt to be misleading and in most instances are valueless.

Genus *PISOTRIGONIA* van Hoepen, 1929B.

(Genotype by original designation: *P. salebrosa* van Hoepen p. 20, pl. V, figs. 1-6 from the Ndabana beds of Zululand.)

(Synonym: *Rinetrigonia* van Hoepen 1929B, genotype *Trigonia ventricosa* Krauss. *Salebrosa* and *ventricosa* probably are identical, in which case *ventricosa* has precedence.)

Kitchin, who did such admirable work on the Trigonias of the Oomia beds in Kachh and of the Uitenhage beds of South Africa, was not able to separate forms from these two regions that he referred to *T. ventricosa* Krauss. Van Hoepen not only has made them specifically distinct but placed them in different genera. Rennie (1936, p. 330) has protested against this as wrong and unnatural, and I agree with him in recognising one genus only for the group and probably a common species in these two regions. Of the two names *Pisotrigonia* has precedence, since *Rinetrigonia* was proposed merely in the last sentence of the description of *Pisotrigonia*.

Pisotrigonia occurs in the same beds as *Iotrigonia*—that is, in the Uitenhage beds of South Africa, the Ndabana beds of Zululand and the Oomia beds of Kachh; so that the same reasoning that was used above in determining the age of *Iotrigonia* applies to *Pisotrigonia*.

The genus (part of the group of the section *Scabrae* of the *Trigonias*) is lunate in outline with very concave dorsal margin and even more curved, convex, ventral margin. The anterior portion is very inflated. The costae run diagonally. Posterior costae are plain or papillate. Anterior costae are coarsely tuberculate, with a median group that are tuberculate only towards the ventral ends.

Pisotrigonia is very similar to *Pterotrigonia* van Hoepen and *Ptilotrigonia* van Hoepen, in each of which, however, all costae are tuberculate.

Species of the genus include *P. ventricosa* (Krauss)⁶ which occurs in the Uitenhage beds of South Africa, in the "*Trigonia smeei* beds" of Tendaguru (East Africa) and the Oomia beds of Kachh. *P. salebrosa*, the genotype, is regarded by Rennie as a synonym of *P. ventricosa*, and I agree. The forms recorded by van Hoepen as *salebrosa* are from the Ndabana beds of Zululand. *Trigonia subventricosa* Stanton from Neocomian beds in South Patagonia probably is correctly placed in *Pisotrigonia* although the tubercles on the anterior costae are small. This species is recorded but not figured by Piroutet from New Caledonia (1917, p. 128).

It is doubtful if any other described species rightly can be placed in *Pisotrigonia*. Most other forms that have been compared with the *ventricosa* group belong to *Ptilotrigonia*.

PISOTRIGONIA sp. Pl. 1, figs. 2, 3.

Several fragments of external moulds and several internal moulds are present of a species of *Pisotrigonia*. It has the typical form of the *Scabrae* (strongly lunate outline and very inflated anterior) and has also the characteristic ornament and wide smooth marginal carina of this genus. Two squeezes from external moulds are figured, the smaller of which shows the usual strong ventral curvature; and both show a sharp change from strongly tuberculate, oblique, anterior ribs to simple, sharp posterior ribs. Both have concentric growth striae that do not show well in the figures.



Sufficient is shown in these fragments to indicate that the species is distinct from the three forms that have been described for the genus. It is most similar to *P. kraussi*. Both forms have five posterior ribs with an abrupt change to coarse anterior ribs that bear very strong clavate tubercles. A study of the growth lines on the several fragments of this species suggests that the changing shape of the individual, from youth to maturity, is not unlike that of *P. kraussi*.

The available material is not sufficiently good to justify the introduction of a new specific name.

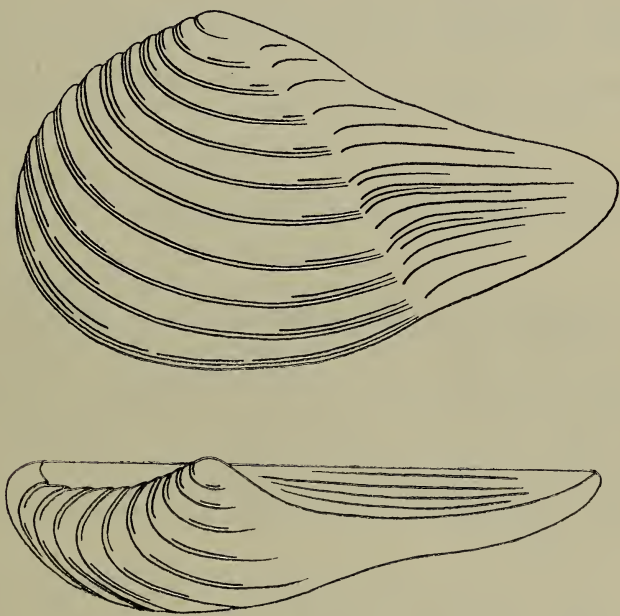
⁶ The bibliographic references to these species are as follows:—*P. ventricosa* Krauss sp. 1842, p. 30, redescribed and figured by Kitchen from the Uitenhage beds (1908, p. 91, pl. III, fig. 1) and from the Oomia beds (1903, p. 104, pl. X, figs. 4-8); *P. kraussi* Kitchen sp. 1908, p. 95, pl. III, fig. 2; *P. salebrosa* van Hoepen 1929 B, p. 20, pl. V, figs. 1-6; *P. subventricosa* Stanton sp., 1901, p. 18, pl. IV, figs. 19, 20.

Genus *INDOTRIGONIA* Dietrich 1933.

(Genotype, by original designation: *Trigonia smeei* J. de C. Sowerby from the Oomia beds of Kachh.)

INDOTRIGONIA (?) sp. Pl. I, figs. 4a, b; 6.

One external mould with the ornament abraded (pl. 1, fig. 4) is of a shell with straight ventral and dorsal margin and uniformly rounded anterior margin, with the umbones well towards the anterior end. The ornament is of strong concentric ribbing. There is a wide, shallow postero-ventral sulcus, a broad carina and a shallow trough-like posterior cardinal area. In and posterior to the sulcus the ribbing apparently ceases and the surface is marked only with growth striae. One other external mould (fig. 6) apparently of the same species shows the strength and simplicity of the concentric anterior ribbing.



Restoration.

This apparently is one of the purely concentrically ornamented *Trigonia* groups that, as suggested above in the section on *Iotrigonia*, are probably end-points of several lineages. Four such genera have been erected so far for Cretaceous forms—*Rutitrigonia* and *Pleurotrigonia* van Hoepen, *Indotrigonia* Dietrich and *Sphenotrigonia* Rennie. Although it is not definite that it belongs to *Indotrigonia*, the species is perhaps more comparable to members of that genus than any other. Forms belonging to it have very strong concentric costae, although there may be rudiments of other ornament in the umbonal regions (the umbo of this specimen is too abraded to register the early ornament). From the two species known in the genus (both from the Oomia beds of Kachh, with the genotype occurring also in Tanganyika) this form is distinct. The genotype, *T. smeei* (see particularly Kitchin, 1903, pls. III, fig. 9; IV, figs. 1-3) has a very narrow sulcus and a wide triangular area. *T. crassa* Kitchin (1903, p. 44, pls. IV, figs. 4-6; V, figs. 1-3) is

more triangular, has no sulcus and a less defined area. Both those species, which differ from this form in those features, also differ in being strongly ribbed on the area.

Forms of the *Indotrigonia* type occur later in the Cretaceous (*Trigonia meridiana* Woods, 1917, p. 6, pl. I, figs. 2-7, from the Albian of New Zealand is one example). Whether these indicate an extended range of the genus or a parallel development is problematical.

PSEUDOMONOTIS sp. Pl. I, figs. 7, 8.

A small pteriid lamellibranch is present with the following features: The left valve is inflated, ornamented with fine radial costae arranged as primary and secondary ribs, and with a small posterior ear. The right valve is flat and circular and its ornament is unknown. It is best placed in *Pseudomonotis*.

The related genus *Oxytoma* with longer posterior ears is rather more common than *Pseudomonotis*; but although more characteristic of Jurassic rocks, *Pseudomonotis* extends into the Lower Cretaceous, where such species as *Avicula* (*Oxytoma*) *tardensis* Stanton (1901, p. 14, pl. IV, figs. 6, 7) possibly represent it. Immature individuals of *Maccoyella* of the *corbiensis* group also resemble the pseudomonotids.

ASTARTE (?) sp.

A few very badly preserved specimens may represent this genus, but they are too poor for generic determination.

PANOPE sp. Pl. I, fig. 5a, b.

There are several fragments and one complete internal mould of a *Panope*. Differences between species in this group are so small and variations within a species so great that the few fragments available are not sufficient to link it with any described species. The one complete specimen figured is very short. But short variants quite like this occur in several species (see, e.g., one specimen of *P. mandibula* Sow. sp., figured by Woods—1909, pl. XXXVII, fig. 5). Similar but unfigured short variants are known in the Australian Aptian species *P. rugosa* (Moore). The long range of *Panope* makes it of little use for delimiting the age of the beds.

One external mould shows extremely faint radial striations from umbo to ventral margin in a central zone of the test. Fine radial striations or papillations, although rare, are not unknown on the genus.

Genus HIBOLITES (Mountfort) Mayer-Eymar 1863.

HIBOLITES sp. Pl. I, fig. 9.

There are several impressions of a belemnite but only one (here figured) shows the external groove. It is a member of the *Hibolites* group, most possibly *Hibolites* itself; but the material is not sufficient to determine the species (the one form with a groove showing is the youngest individual in the collection; and the few other fragments are not sufficient to determine the variation in shape of the species). Also, it is not sufficient to determine whether it may not be a member of the closely related genera *Mesohibolites* Stolley and *Neohibolites* Stolley. Stolley (1919, p. 48) gives the range of these genera as: *Hibolites* (Dogger to Aptian), *Mesohibolites* (Neocomian and Aptian), *Neohibolites* (Aptian to Upper Cenomanian).

Note.—This paper was written during a period of military leave.

BIBLIOGRAPHY.

- CRAGIN, F. W., 1905. Palaeontology of the Malone Jurassic Formation of Texas. *U.S. Geol. Surv. Bull.* 266
- CRICKMAY, C. H., 1932. Contributions towards a Monograph of the Trigoniidae I. *Amer. J. Sci.*, XXIV, pp. 443-464.
- DIETRICH, W. O., 1933. Zur Stratigraphie und Palaeontologie der Tendaguru-Schichten. *Palaeontographica*, Supp. VII, Reihe 2 (ii), pp. 1-86, pls. I-XII.
- DUNSTAN, B., 1898. The Mesozoic Coal Measures of Stanwell and Associated Formations. *Geol. Surv. Queensl.*, Pub. 131.
- ETHERIDGE, R., Jr., 1909. Lower Cretaceous Fossils from the Sources of the Barcoo, Ward and Nive Rivers. Part II—Cephalopoda (cont.) *Rec. Aust. Mus.*, VII, No. 4, pp. 235-240, pls. LXV-LXVIII.
- KITCHIN, F. L., 1903. The Jurassic Fauna of Cutch. Vol. III. The Lamelli-branchiata. No. 1, Genus *Trigonia*. *Palaeont. Indica*. Ser. IX, 122 pp. I-X.
- 1908. The Invertebrate Fauna and Palaeontological Relations of the Uitenhage Series. *Ann. S. African Mus.* VII, part 11 (3), pp. 21-250, pls. II-XI.
- 1929. On the Age of the Upper and Middle Dinosaur Deposits of Tendaguru, Tanganyika Territory. *Geol. Mag.*, LXVI, pp. 193-220.
- 1926. The so-called Malone Jurassic Formation in Texas. *Geol. Mag.*, LXIII, pp. 454-469.
- KRAUSS, F., 1850. Ueber einige Petrefacten aus der unteren Kreide des Kaplandes. *Nova Acta Acad. Caes. Leop.-Carol. Nat. Cur.*, XXII (2), p. 489.
- PIROUTET, M., 1917. Étude Stratigraphique sur la Nouvelle-Calédonie. (Thesis, Fac. Sci. Paris) *Macon*.
- RENNIE, J. V. L., 1936. Lower Cretaceous Lamellibranchia from Northern Zululand. *Ann. S. African Mus.* XXXI (3), No. 9, pp. 277-391, pls. XXXVII-LV, 1 table.
- SHARPE, D., 1856. Description of Fossils from the Secondary Rocks of Sunday River and Zwartkop River. *Trans. geol. Soc. Lond.*, Ser. 2, VII, p. 193.
- SPATH, L. F., 1925. On Upper Albian Ammonoidea from Portuguese East Africa. *Ann. Transvaal Mus.*, XI (3), pp. 179-200, pls. XXVIII-XXXVII.
- 1930. On the Cephalopoda of the Uitenhage Beds. *Ann. S. African Mus.*, XXVIII (2), pp. 131-157, pls. XIII-XV.
- 1933. Revision of the Jurassic Cephalopod Fauna of Kachh (Cutch). *Palaeont. Indica* (N.S.), IX (2), Part 6.
- 1935. On the Age of Certain Species of *Trigonia* from the Jurassic Rocks of Kachh (Cutch). *Geol. Mag.*, LXXII, pp. 184-189.
- STANTON, T. W., 1901. The Marine Cretaceous Invertebrates. *Reps. Princeton Univ. Exped. to Patagonia*, 1896-1899, IV, Part 1.
- STOLLEY, E., 1919. Die Systematik der Belemniten. *Jahresb. d. Niedersächs. geol. Vereins Hannover*, 11, p. 1-59.
- WALKOM, A. B., 1915. The Mesozoic Floras of Queensland, Part 1. The Floras of the Ipswich and Walloon Series (a) Introduction. (b) Equisetales. *Geol. Surv. Queensl.* Pub. 252.
- 1917. *Idem.* (c) Filicales, etc. *Geol. Surv. Queensl.* Pub. 257.
- 1917. *Idem.* (d) Ginkgoales, (e) Cycadophyta, (f) Coniferales. *Geol. Surv. Queensl.*, Pub. 259.
- 1918. Mesozoic Floras of Queensland Part II. The Flora of the Maryborough (Marine) Series. *Geol. Surv. Queensl.*, Pub. 262.
- 1919. Mesozoic Floras of Queensland. Parts III and IV. The Floras of the Burrum and Styx River Series. *Geol. Surv. Queensl.*, Pub. 263.
- 1928. Fossil Plants from Plutoville, Cape York Peninsula. *Proc. Linn. Soc. N.S. Wales*, LIII, pp. 145-150, pls. XIII-XIV.

- WHITEAVES, J. F., 1876. On Some Invertebrates from the Coal-Bearing Rocks of the Queen Charlotte Islands. *Geol. Surv. Canada, Mesozoic Fossils*, Part 1 (pp. 1-92, pls. I-X).
- WHITEHOUSE, F. W., 1924. Dimitobelidae, a new Family of Cretaceous Belemnites. *Geol. Mag.*, LXI, pp. 410-416.
- 1926. The Cretaceous Ammonoidea of Eastern Australia. *Mem. Queensl. Mus.*, VIII (3), pp. 195-242, pls. XXXIV-XLI.
- 1927. Additions to the Cretaceous Ammonite Fauna of Eastern Australia, Part 1. *Mem. Queensl. Mus.*, IX (1), pp. 109-120, pls. XVI-XVII.
- WILCKENS, O., 1922. The Upper Cretaceous Gastropods of New Zealand. *N. Zeal. Geol. Surv.*, Palaeont. Bull. No. 9.
- WOODS H., 1904-1913. A Monograph of the Cretaceous Lamellibranchia of England, vol. II. *Palaeont. Soc. London*.
- 1917. The Cretaceous Fauna of the North-Eastern Part of the South Island of New Zealand. *N. Zeal. Geol. Surv.*, Palaeont. Bull. No. 4.
- VAN HOEPEN, E. C. N., 1929A. The Cretaceous Beds of Zululand. *Internat. Geol. Congr. South Africa. Durban-Zululand Guide Book*, pp. 10-18.
- 1929B. Die Krytfauna van Soeloeland. I. Trigoniidae. *Palaeont. Navorsing, v.d. Nasionale Mus. Bloemfontein*, D1 (1), 38 pp. Pls. I-VII.

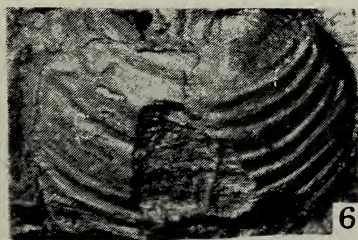
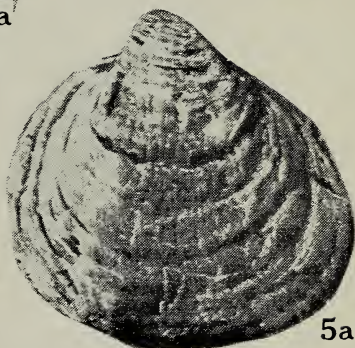
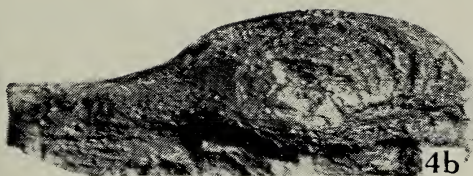
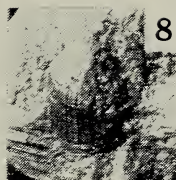
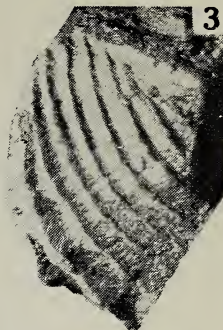
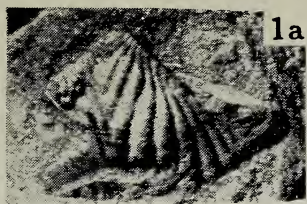


EXPLANATION OF PLATE I.

(All figures natural size.)

- Fig. 1a, b.—*Trigonia limatula* sp. nov. Lateral and cardinal views of a left valve (holotype).
- Fig. 2, 3.—*Pisotrigonia* sp. Plasticine squeeze of two fragments showing change in ornament from anterior tuberculate ribs to posterior plain costae.
- Fig. 4a, b.—*Indotrigonia* (?) sp. Lateral and cardinal view of a plasticine squeeze of a left valve.
- Fig. 5a, b.—*Panope* sp. The internal mould of a complete specimen. (a) right valve, (b) cardinal view.
- Fig. 6.—*Indotrigonia* (?) sp. Plasticine squeeze of a fragment showing regular, prominent, concentric ribs that appears to belong to the same species as figs. 4a, b.
- Fig. 7, 8.—*Pseudomonotis* sp. Plasticine squeezes of two left valves; fig. 8, showing the small posterior ear.
- Fig. 9.—*Hibolites* sp. Plasticine squeeze of a small individual.

(Material from the collections of the Geological Survey of Queensland.)



CONTRIBUTIONS TO THE QUEENSLAND FLORA, No. 9.

By C. T. WHITE, Government Botanist.

(Received 27th June, 1945; tabled before the Royal Society of Queensland, 26th November, 1945; issued separately, 9th October, 1946.)

The present paper contains additions to the flora of Queensland since the publication of the previous Contributions (these Proceedings Vol. lv, pp. 59-83: 1944).

Family DILLENIACEAE.

Hibbertia cistifolia R. Br. in DC. Syst. Veg. i, 431.

Cook District: 10 miles north-east of Iron Range, in grassy parkland forest, *H. Flecker* (buds) 14-4-1944 (N.Q. Nat. Club, No. 8691).

A Northern Territory species not previously recorded for Queensland.

Hibbertia cistoidea n. comb.

Pleuranda cistoidea Hook. in Mitchell's Tropical Australia 363 (1848).

H. stricta R. Br. var. *canescens* Benth. Fl. Austr. i, 27 (1863) in parte.

N.S. WALES.—New England, *Stuart*.

QUEENSLAND.—Maranoa District, Camp XXI, *Drysdale* (Mitchell's Expedition: TYPE). Darling Downs: near Wallangarra, *Mrs. M. S. Clemens* (fs.) Oct. 1944; Bald Mountain, *Mrs. M. S. Clemens* (old fs.) Nov. 1944. Burnett District: Eidsvold, *Dr. T. L. Bancroft*.

Family FLACOURTIACEAE.

Baileyoxylon C. T. White in Journ. Arn. Arb. xxii, 143, pl. 1 (1941).

Flores foemini: Staminodia 5, petalis alterna. Ovarii placentae 3, 1-ovulatae; stigmata 3, libera, sessilia vel subsessilia, crenato-dilatata.

B. lanceolatum C. T. White l.c.

Flos foem.: Petala maris. Staminodia linearia, subcrassa, leviter appanata. Ovarium globosum, glabrum; stigmata libera, sessilia vel subsessilia, crenato-dilatata.

Cook District: Boonjee, nr. Malanda, in rain forest, alt. ca. 2,600 ft., *S. T. Blake* 15224 (fs.) 27-8-1943 (shrub 10 ft., leaves dull green, paler beneath, corolla yellow, petal-appendages orange).

Female flowers were previously unknown. As surmised by Dr. I. W. Bailey on anatomical grounds, *Baileyoxylon* has close affinities to *Trichadenia* Thw. Female flowers in both genera are remarkably alike except that the calyx is calyptrate in *Trichadenia* and there are no staminodia.

Family RUTACEAE.

Acronychia pauciflora sp. nov.

Arbor parva, partibus novellis pubescentibus mox glabris. Folia opposita, unifoliolata; petiolus 1-1.5 cm. longus; lamina elliptica, acuta, subobtusata vel raro obtusa, basi cuneata, utrinque reticulata, nervis

praecipuis ca. 10 in utroque latere, 5-10 cm. longa, 2.5-5 cm. lata. Cymae paucae simplices et 3-florae vel ad florem singulum reductae, axillares saepe ex axillis foliorum delapsorum orientes; pedunculus validus 2-3 mm. longus; pedicellus validus, costatus, breviter pubescens, cum calyce 2 mm. longus. Calycis lobi subrotundi, minuti. Petala linearia 5 mm. longa, in parte inferiore pilis albis brevibus paucissimis obsita. Stamina 3 mm. longa, filamentis in parte inferiore applanatis et pilis albis longis dense obsitis. Discus carnosus, glaber, stylo basin versus hirsuto. Fructus carnosus, in sicco vix 1 cm. diam.

Moreton District: Mt. Glorious, *Mrs. M. S. Clemens* (TYPE: fls.), Jan. 1945. *F. Bray* (very young fts.), May 1943; Samford Creek, *C. T. White* 12638 (fls.), 1-4-1945 (small tree 5 m., flowers greenish white, scanty). Wide Bay District: Imbil, *Mrs. M. S. Clemens* (fts.), Dec. 1943.

Closest affinities of the present species are with *A. laevis* Forst., but the two species can easily be distinguished as follows:—

Leaves very obtuse, cymes once or twice branched, peduncles and pedicels slender, glabrous, common peduncle 0.7-2.5 cm. long .. *A. laevis*.

Leaves mostly subacute, cymes reduced to 1-3 flowers, peduncles and and pedicels stout, pubescent, peduncle 2-3 mm. long *A. pauciflora*.

Lunasia amara Blanco Fl. Filip. 783 (1837).

Cook District: Iron Range nr. Portland Roads, in rain forest, *H. Flecker* (buds) 13-4-1944 (tree) (N.Q. Nat. Club No. 8542).

Though the specimens are in bud only, I have no hesitation in referring them to the above plant, previously, so far as known, confined to the Philippines.

Family VITACEAE.

Cayratia eury nema B. L. Burtt in Kew Bulletin 1939, p. 179.

Moreton District: Mt. Glorious, *Mrs. M. S. Clemens* (fls.), January, 1945.

Not previously recorded for Queensland.

Family LEGUMINOSAE.

Acacia aulacocarpa A. Cunn. ex Benth. in Hook. London Journ. Bot. i, 368 (1842).

N.S. WALES.—Richmond River to Queensland border.

QUEENSLAND.—All round the coast up to 75 miles inland.

NORTHERN TERRITORY.—Darwin.

NORTH-WEST AUSTRALIA.—Kimberley.

One of the most widely distributed species of the genus in Australia.

Acacia aulacocarpa A. Cunn. var. **macrocarpa** Benth. Fl. Austr. ii, 410 (1864).

A. crassicaarpa A. Cunn. ex Benth. in Hook. Lond. Journ. Bot. i, 369 (1842).

QUEENSLAND.—Tropical coast from Keppel Bay to Cape York Peninsula (Temple Bay).

Acacia aulacocarpa A. Cunn. as understood by Australian botanists is one of the most widely distributed of wattles. Unfortunately, I have not seen any types and have placed *A. crassicarpa* A. Cunn. as a synonym of Bentham's variety *macrocarpa* following his description and a drawing of the pod of the type of *A. crassicarpa* A. Cunn. by Maiden (Proc. Roy. Soc. Queensl. xxx, pl. VII: 1918). In the field this variety can generally be distinguished by its larger broader phyllodes up to 5 cm. wide, but this is not an invariable character, the only true distinction being the very broad and woody pod. It has not been found outside the tropics.

***Acacia aulacocarpa* A. Cunn. var. *fruticosa* var. nov.**

Frutex 0.75-3 m. altus, ramulis validis acute triangularibus; phyllodia ad 9 cm. longa, 1.5-2.5 cm. lata, 3-5-plo longiora quam lata; spicae 2.5-4 cm. longae, floribus aurantiacis; legumen ca. 5 cm. longum et 1 cm. latum, valvis crassis subligneis lineis obliquis valde elevatis notatis.

Moreton District: Ngun Ngun, Glasshouse Mts., alt. 800 ft., common on top and rocky slopes of the mountain, *C. T. White* 7651 (TYPE: fls. and old pods), 20-3-1931 (shrub or small tree up to 3 m. high, fls. deep orange); Mt. Coolum, on the summit, *Mrs. M. S. Clemens* (very young fl. spikes and old pods), April 1945 (shrub 2 ft.); Wide Bay District: Mt. Cooroora, alt. abt. 800 ft., *C. T. White* 1889 (fls.), March 1923 (small bushes 3-4 ft. high with very bright flowers).

This variety is distinguished by its shrubby habit, strong acutely triangular branchlets, deep yellow flowers, as opposed to the very pale yellow of typical *A. aulacocarpa* A. Cunn., narrow pods with somewhat more woody valves and the oblique lines or costae on them thicker and in consequence more prominent.

As I understand the three varieties they can be distinguished as follows:—

Trees, phyllodes including the petiole 7-18 cm. long, 1-5 cm. wide, $4\frac{1}{2}$ -9 times as long as broad, spikes with the peduncle 2.5-7 cm. long, flowers pale yellow.

Pods usually about 1.5 cm. wide but varying from 1-2 cm., valves rather thin, scarcely woody *A. aulacocarpa*.

Pods usually about 2.5 cm. wide but varying from 1.5-3 cm., valves thick and woody *A. aulacocarpa*
var. *macrocarpa*.

Shrub or at most a small tree 3 m. high, phyllodes including the petiole 5-9 cm. long, 1.5-2.5 cm. wide, 3-5 times longer than broad, spikes with the peduncle 2.5-4 cm. long, flowers bright yellow. Pods about 1 cm. broad, valves woody or almost so *A. aulacocarpa*
var. *fruticosa*.

***Bossiaea microphylla* Sm. in Trans. Linn. Soc. ix, 303 (1808).**

Darling Downs District: Nr. Ballandean, *Mrs. M. S. Clemens* (fls.), Oct. 1944.

A very common shrub in N.S. Wales and Victoria. not previously recorded for Queensland.

***Maniltoa* sp.**

Cook District: Chilli Creek, 5 miles S.W. of Portland Roads, *Capt. W. L. Scott* (leaves and leaf-buds), 10-4-1944.

The above specimens are sterile and therefore cannot be accurately identified specifically, but they are recorded here as the genus is new to Australia.

Pultenaea dentata Labill. Pl. Nov. Holl. i, 103, t. 131 (1804).

Darling Downs District: Eukey via Stanthorpe, Mrs. E. Goebel (old pods), Nov. 1944.

Not previously recorded for Queensland. The specimen is a small one and far advanced in pod but agrees well with southern material.

EUGENIA L.

(Sect. *Syzygium*.)

Though the three following species have the general appearance of an *Acmena*, they would come under *Syzygium* as outlined by Merrill and Perry (Mem. Am. Acad. Arts and Sciences xviii, pt. 3, 135-202: 1939). These authors restrict *Eugenia* to the New World and a few Old World species. Most of the Australian species come under *Syzygium*, a few under *Acmena* and one under *Cleistocalyx*. Dr. H. E. Dadswell, the well-known Australian wood technologist of the Council for Scientific and Industrial Research, informs me that the woods of these, at least as far as Australian species are concerned, are indistinguishable generically but are all totally different from the American species of *Eugenia*. The woods of our peculiar *E. carissoides* F. Muell. and *E. macrohila* White & Francis have so far not been studied. These probably belong to *Jossinia* Comm., if we recognise that genus. It seems that *Eugenia* must eventually be removed from the Australian flora, though the name among foresters and horticulturists has become just as much a vernacular as Eucalyptus, Dahlia, Cosmos etc. Until a critical examination of all the Australian species is made I am retaining *Eugenia* in the present paper.

Eugenia oleosa F. Muell. Fragm. Phytogr. Austr. v, 15 (1865); Benth. Fl. Austr. iii, 287 (1866); Bailey, Queens. Fl. ii, 664 (1900); C. T. White Contr. Arn. Arb. iv, 80 (1933).

Cook District: Rockingham Bay, *Dallachy*; Bellenden Ker, *Bailey*; Gadgarra, common along rain-forest creeks, *Kajewski*; Head of Wild River, *J. F. Bailey*.

Eugenia Coolminiana C. Moore, Handbk. Fl. N.S. Wales 207 (1893).

E. cyanocarpa F. Muell. ex Maid. & Betcher, Proc. Linn. Soc. N.S. Wales xxix, 740 (1905); Francis, Austr. Rain For. Trees 8, 293 (1929); Harris, Wild Fl. Aus. 50, 110, tab. 48 (1932); C. E. Hubbard Bot. Mag. tab. 9602 (1940).

QUEENSLAND AND N.S. WALES.—This species is very common in coastal Eastern Australia from Port Jackson District (N.S. Wales) to Keppel Bay (Port Curtis District, Queensland). It is doubtfully distinct as a species from *E. oleosa* F. Muell. and apart from the calyx-tube I have failed to find any valid distinctions between *E. Coolminiana* C. Moore and *E. cyanocarpa* F. Muell., in which case Moore's name has priority, though his description was meagre in the extreme. Specimens named by him are in the National Herbarium, Sydney and have been distributed by that institution. Maid. and Betcher, i.e., regarded *E. cyanocarpa* F. Muell. and *E. Coolminiana* C. Moore as distinct but evidently changed their opinion later, for they omitted the latter name from their Census of N.S. Wales Plants, 1916.

Eugenia crebrinervis* sp. nov.E. cyanocarpa* F. Muell. var. *montana* C. T. White herb.

Arbor magna, cortice lamellato, ramulis subvalidis; folia elliptica, elliptico-lanceolata vel lanceolata, apice acuminata vel caudato-acuminata basi cuneata, supra atro-viridia nitida, subtus opaca, pallidiora, nervis lateralibus crebris numerosis subtus prominulis, e costa media angulo ca. 60° orientibus, lamina 6-7.5 cm. longa 1.5-3.5 cm. lata, petiolo ca. 0.6-1 cm. longo. Inflorescentiae terminales trichotome ramosae ca. 3-4 cm. longae, ramulis quam in *E. oleosa* et *E. cyanocarpa* rigidioribus et validioribus. Calyx turbinatus vel anguste turbinatus basin versus in pedicellum distinctum gradatim angustatus cum pedicello ca. 6 mm. longus; petala 4 (raro 5) fere orbiculata vel oblata; stamina numerosa tenuissima deinde patentia, ca. 6 mm. longa. Bacca globosa vel leviter depresso-globosa, ad 2.5 cm. diam., carne farinacea, subacidula, semine plerumque solitario.

NEW SOUTH WALES.—Tooloom Scrub, common in rain forest, C. T. White 12549 (fts.) 16-3-1944 (large tree buttressed at the base, bark scaly, leaves dark glossy green above, paler and opaque beneath, fruits purple slightly depressed globular up to 2.5 cm. diam., flesh mealy, very slightly acidulous, with a single very depressed seed, usually very badly grub-infested).

QUEENSLAND.—Moreton District: Lamington National Park, alt. 3,000 ft., D. A. & L. S. Smith (TYPE: fls.), 31-12-1943 (tree in rain forest); Roberts Plateau, Lamington National Park, C. T. White (fls.), 27-2-1920 (very large tree with scaly bark); Mt. Mistake, Mrs. M. S. Clemens (young fts.), Jan. 1944; Mt. Glorious, Mrs. M. S. Clemens (young fts.), Jan. 1945.

I had at first regarded this as a variety of *E. Coolminiana* C. Moore (*E. cyanocarpa* F. Muell.) and named it up as such in the Queensland Herbarium. I quote my herbarium name as it is possible some specimens may have been distributed under it. The tree has long been known to us in the field and is represented in the Queensland Herbarium by several sheets other than those quoted above, but the material in all cases is only fragmentary. It is difficult to draw a sharp line between the three species, but the outstanding features of *E. crebrinervis* C. T. White are the close arrangement of the lateral nerves and the apparently constant terminal inflorescence. They can be keyed out as follows:—

Small or medium sized trees, lateral nerves 3-4 mm. apart, inflorescence axillary or terminating short lateral branches.

Calyx narrowly turbinate markedly tapering towards the base into a pedicel. A tropical species *E. oleosa*.

Calyx broadly turbinate, sessile or more or less abruptly tapering towards the base into an exceedingly short pedicel. Port Jackson to Tropics of Capricorn .. *E. Coolminiana*.

Large tree, lateral nerves 1-2 mm. apart, inflorescence terminal, calyx turbinate to narrow-turbinate tapering into a distinct pedicel, sometimes abruptly so. A mountain species of Northern N.S. Wales and Southern Queensland *E. crebrinervis*.

C. E. Hubbard, l.c., describes the flowers of *E. Coolminiana* C. Moore (*E. cyanocarpa* F. Muell.) as borne on pedicels of 2-4 mm., but after a close examination of a number of Australian specimens I would call them sessile or nearly so unless we regard the ultimate branches of the inflorescence as pedicels—which is sometimes done in *Eugenia*.

Leptospermum minutifolium sp. nov.

L. flavescens Sm. var. *minutifolium* F. Muell. ex Benth, Fl. Austr. iii, 105 (1866).

Frutex glaber vel partibus novellis sericeis. Folia elliptica vel fere spatulata, crassiuscula, patentia vel deinde leviter recurva, supra leviter concava subtus convexiuscula, utrinque punctata vel subtus fere tuberculata, 2-3 mm. longa, 1-2 mm. lata. Flores brevissime pedicellati; calyx glaber, late campanulatus 4 mm. diam., lobis 5 oblongis albis fere membranaceis tubum aequantibus mox deciduis; petala alba suborbicularia 2 mm. diam., basi in unguem latum brevem angustata. Stamina petala aequantia. Ovarium 5-loculare apice planum. Capsula semi-supera ca. 7 cm. diam.

N.S. WALES.—New England District: New England, *C. Stuart*; Guyra, *Rev. E. Norman McKie* 44 (a, b, & c), 45, 46 & 47 (all in Nat. Herb. Sydney); Moredun Creek, N.W. of Guyra, on the western slopes. *Rev. E. Norman McKie* W. 27 (Herb. Brisbane); Tungston via Deepwater, *T. D. Lynch*; Hanging Rock, via Nundle, *E. Julius* 5; Wilson's Downfall, *R. H. Cambage* 2825; Tenterfield, *J. H. Maiden* (all in Nat. Herb. Sydney).

QUEENSLAND.—Darling Downs District: Base of Mt. Norman, via Wallangarra, *Mrs. M. S. Clemens* (TYPE: fls.) Nov. 1944; Eukey via Stanthorpe, *Mrs. E. Goebel per M. S. Clemens* (fts.), Nov. 1944; Ballandean, *J. E. Young*.

Mr. E. Cheel, the well known authority on *Leptospermum* and allied genera, informed me in a letter that he had sorted this variety out as a distinct species in the folders at the National Herbarium, Sydney, but had not published anything on it. I am indebted to him for most of the New South Wales localities. The present species has a very limited geographical distribution so far as known, being confined to the New England Tableland of New South Wales and the "granite belt" of south-east Queensland.

It comes close to *L. flavescens* Sm. var. *microphyllum* Benth. and *L. Liversidgei* Bak. & Sm., but the three can be distinguished as follows:—

Only the very young parts sericeous, leaves without any citron odour, spreading shrubs of sandy forest lands.

Leaves flat, 5-7 mm. long, 2 mm. broad, midrib clearly visible (almost prominent) on the lower surface, smooth, epunctate and faintly 3-nerved above, black punctate beneath. Coastal sandy lands of N.S. Wales and Queensland

L. flavescens var.
microphyllum.

Leaves slightly concave above and convex beneath, 2-3 mm. long, 1-2 mm. broad, midrib not visible on either surface, punctate above, almost tuberculate-punctate beneath. New England Tableland extending to Queensland granite belt

L. minutifolium.

Branchlets pubescent even in the older stages, leaves strongly citron-scented, upright shrub of peat swamps.

Leaves flat or slightly concave above, about 5 mm. long, 2 mm. broad, midrib not visible but leaves sometimes indistinctly 3-nerved, oil glands not always very distinct and leaves frequently almost epunctate. Coastal N.S. Wales from Port Macquarie to Wide Bay District (Bundaberg), Queensland

L. Liversidgei.

***Myrtus sericocalyx* sp. nov.**

Arbor ad 15m. alta, cortice atrobrunneo aliquanto laminato, partibus novellis pilis sericeis longis dense obsitis deinde glabris; folia elliptico-lanceolata, longe acuminata basi cuneata, supra nitidula, subtus opaca crebre punctata, nervis supra indistinctis, subtus invisibilibus, lamina 4-5 cm. longa, 1.5-2 cm. lata, petiolo 5-6 mm. longo. Flores albi, fragrantés, in cymas racemiformas 5-9-floras dispositi; cymae 2 cm. longae, pedicellis parce sericeis tenuibus 4-5 mm. longis, bracteis sub calyce lineatis. Calyx dense sericeus, 5-lobatus, tubo late urceolato 1.5 mm. lato, lobis acuminatis late triangularibus 1 mm. longis; petala 5, orbicularia, ciliolata, 4 mm. diam.; stamina petalis breviora; ovarium 4-loculare; bacca globosa limbo coronata, pisiformis, in sicco 6 mm. diam.; semina 2-3.

N.S. WALES.—Acacia Plateau near the Queensland border, common in rain forest, *C. T. White* 12552 (TYPE: fls. and fts.), March 1944 (tree up to 15 m. high, 0.33 m. diam., bark brown, rather flaky, leaves very glossy above, flowers white, fragrant).

QUEENSLAND.—Moreton District: Mt. Glorious, *Mrs. M. S. Clemens* (fls.) Jan. 1945.

I am indebted to Mr. R. H. Anderson for comparing this species with others from New South Wales. I thought it may be a form of *M. fragrantissima* F. Muell., a species very poorly represented in Australian herbaria. It differs in several characters, however, e.g.,

Leaves subacute, rounded or obovate; veins discernible on lower surface, calyx 4-merous	<i>M. fragrantissima</i> .
Leaves long acuminate, veins not visible on the lower surface, calyx 5-merous	<i>M. sericocalyx</i> .

From the raceme-like inflorescence Mr. Anderson considers *M. sericocalyx* C. T. White to come closest to *M. Bidwillii* Benth. but this differs in the leaves being broader, the veins clearly discernible on both surfaces and the calyx being quite glabrous. I have never been able to distinguish satisfactorily *M. Bidwillii* Benth. from *M. racemulosa* Benth. and *M. acmenioides* F. Muell.

Family AIZOACEAE.

***Macarthuria ephedroides* sp. nov.**

Caules numerosi, ramosi, 0.5-0.75 m. alti, suffrutices densos ca. 1 m. diam. formantes, ramulis glabris complanato-quadrangularibus. Folia sparsa squamiformia lineari-lanceolata, 3-7 mm. longa. Flores apetalí, singuli vel pauci apicibus ramulorum dispositi, pedicellis 1 mm. longis. Sepala 5, libera, virescentia, ovata, acuta, 2.5 mm. longa, 1.5 mm. lata. Stamina 8, filamentis tenuibus in parte inferiore late expansis et in cupulam membranaceam connatis, antheris 2-locularibus. Ovarium triloculare, glabrum, ovulo in loculis 1. Capsula submembranacea, seminibus nigris vix 2 mm. longis dense et minute concentrice ruguloso-punctatis.

Mitchell District: Enniskillen, in rocky sandstone hills, moderately common in small patches, *C. T. White* 12417 (fls. and capsules), Nov. 1943 (subshrub, numerous stems—many of them dead—from a common stock, forming dense masses abt. 1 m. diam.).

I had provisionally determined this as *M. apetal*a Harv. but submitted specimens to Mr. A. W. Jessep, Government Botanist, National Herbarium, Melbourne, for comparison with West and North Australian material, and he replied: "I do not think your plant is referable to *M. apetal*a Harv. although superficially resembling the Northern Territory form of that species, which constantly seems to have terete branches and obtuse calyx lobes. We have nothing in our folders with such strongly angled branches and acutely indurated perianth segments. I am inclined to regard your recent discovery as an entirely new species."

Family COMPOSITAE.

CALOTIS R. Br.

Notes on the Genus in Queensland with a Key to the Species.

The genus *Calotis* consists of 26 species, with two exceptions, *C. animitica* Merr. and *C. Gaudichaudii* Gagnep., both from Indo-China, all represented in Australia. Of the 24 Australian species 17 occur in Queensland. The capitula of most species form unpleasant burrs which are a frequent infestation in wool. By means of the barbed awns of the pappus they very easily become entangled in wool or other soft material. They are widely spread and the more objectionable ones—notably *C. hispidula* F. Muell. and *C. squamigera* C. T. White are familiarly known as "Bindi-eye" or Bindie. One species, *C. lappulacea* Benth., is most generally known as the Barwon Flea or Bogan Flea. Burr Daisy is the generally accepted standardised popular name for members of the genus. The finding of three new species among recent collections examined by me, two species described by Domin, one by Maiden and Betcher and one by J. M. Black, since the publication of Bailey's "Queensland Flora" make a revision of the Queensland members of the genus desirable. I have removed three and added seven species to that account.

DICHOTOMOUS KEY TO QUEENSLAND SPECIES OF CALOTIS.

- | | |
|---|-----------------------|
| 1. Heads terminal, pedunculate, rays usually conspicuous . | 2 |
| Heads very numerous, sessile in the leaf axils, rays inconspicuous | 16 |
| 2. Pappus composed of barbed spines with or without alternating scales | 3 |
| Pappus composed of long soft plumose hairs | <i>C. inermis</i> |
| 3. Pappus of 1 or more rigid awns free or the reduced ones or scales shortly united at the base, scales or reduced awns present or absent | 4 |
| Pappus of 2-8 awns united in a cup at the base, twiggly perennial | <i>C. crinacea</i> |
| 4. Pappus of several unequal awns distinct at the base without alternating scales, reduced or scale-like awns or setae | 5 |
| Pappus of 1-several awns and 2 or more scales or reduced or scale-like awns or setae | 11 |
| 5. Achenes winged, glabrous or more or less clothed with long hairs, the wings always ciliate | 6 |
| Achenes not winged, glabrous, muricate or clothed with short hairs | 9 |
| 6. Achenes hairy, with wings narrowed downwards | 7 |
| Achenes glabrous, wings dilated at the base and curved upwards | <i>C. ancyrocarpa</i> |

- | | |
|---|--------------------------|
| 7. Pappus awns 4-7 shorter than the achene | 8 |
| Pappus awns 14-18 as long as the achene | <i>C. multicaulis</i> |
| 8. Achenes pubescent all over, ray florets purple | <i>C. porphyroglossa</i> |
| Achenes thinly pubescent in the upper part only, wings
very shortly ciliate, ray florets white | <i>C. pterosperma</i> |
| 9. Radical leaves persistent, stems stoloniferous | 10 |
| Radical leaves soon withering, stems much branched, leafy,
leaves linear, entire or toothed | <i>C. lappulacea</i> |
| 10. Plant glabrous to hispid-hirsute, radical leaves spatulate,
often broadly and shortly so, toothed, fruiting heads
1 cm. or more in diameter; doubtful if distinct from
next species | <i>C. scabiosifolia</i> |
| Plant glabrous or hairy, radical leaves often narrow,
fruiting heads less than 1 cm. in diameter; doubtful
if distinct from the foregoing species | <i>C. scapigera</i> |
| 11. Awns armed at the tip only with a few retrorse barbs .. | 12 |
| Awns smooth or armed with retrorse barbs for their whole
length or at least the upper half or more | 13 |
| 12. Leaves linear lanceolate, oblong, remotely toothed or
pinnatifid, awns 1 or 2 very unequal ones | <i>C. dentex</i> |
| Leaves cuneate or spatulate-cuneate, toothed or lobed at
the end, hispidulous, awns 2 nearly equal ones | <i>C. scabriuscula</i> |
| 13. Leaves cuneate, toothed at the end | 14 |
| Leaves linear, entire or with a single tooth on either side
towards the top | 15 |
| 14. Awns 2 or 3, with 2 broad truncate scales and sometimes
a smaller one | <i>C. cuneifolia</i> |
| Awns 6-8 alternating with free scales | <i>C. xanthosoidea</i> |
| 15. Twiggy much branched plant; leaves hispidulous, entire
or with a tooth on both sides of the margin, ray florets
yellow, awns 2 and numerous much reduced ones shortly
united at the base | <i>C. suffruticosa</i> |
| Stems with few branches; leaves with very few hairs, very
narrowly lanceolate, entire or with a single tooth on
one side of the margin, ray florets white turning to
purple, awns various, 3-5 larger ones gradually merg-
ing into smaller scale-like ones | <i>C. glabrescens</i> |
| 16. Achenes pale coloured, very pubescent, pappus awns 4-6
alternating with small subulate entire or lobed scales .. | <i>C. hispidula</i> |
| Achenes dark chestnut-coloured when mature, muricate-
hispid, alternating with as many broad, oblong or
rotund scales | <i>C. squamigera</i> |

Excluded Species.

C. breviseta Benth., *C. cymbacantha* F. Muell., *C. microcephala* Benth.

These three species were recorded for Queensland by Ferd. Mueller and F. M. Bailey but are unrepresented in herbaria by specimens actually collected in Queensland territory. Both these authors were in the habit of recording species that occurred in neighbouring States and which they considered must extend over the border and would sooner or later be found in Queensland territory.

Some New or Interesting Species.

***Calotis ancyrocarpa* J. M. Black** Trans. Roy. Soc. South Aus. xlv, 18, pl. iv (1921).

Gregory South District: Birdsville, on alluvial flats, *S. T. Blake* 12230 (fig. and ftg. heads), July 1936 (bushy green annual to 6 in., ray white, disc yellow).

Not previously recorded for Queensland.

***Calotis cuneifolia* R. Br.** in Bot. Reg. vi, t. 504 (1820).

This species is exceedingly common in Queensland over a wide range. Bentham in the "Flora Australiensis" describes the awns as 3 in number, but in most Queensland specimens examined by me there were only 2. Domin (Bibl. Bot. lxxxix (viii) 1209) describes a variety *biaristata*, but apart from the 2 awns instead of 3 I can see no difference in the specimens examined. Three awns do occur but are rare in Queensland plants.

***Calotis cuneifolia* R. Br. var. *glabrescens* n. var.**

Herba gracilis, pilis sparsis obsita; folia anguste cuneata, plerumque ca. 2 cm. longa et 5 mm. lata; achaenia 2-aristata.

Mitchell District: Torrens Creek, in Eucalyptus forest, sandy soil near Warrigal swamp, *C. T. White* 8700 (ftg. heads), 20-3-1933 (TYPE of the variety). North Kennedy District: Warrigal, on Great Dividing Range, alt. 1,400-1,500 ft., in Eucalyptus forest on reddish brown sandy soil, *C. E. Hubbard* & *C. W. Winders* 7111 (ftg. heads), 2-2-1931; West of Pentland, between Warrigal and Burra, alt. 1,500-1,650 ft., on slopes of Great Dividing Range, on shallow sand overlying sandstone, *S. T. Blake* 9949 (fig. and ftg. heads), 19-10-1935 (tufted rather spreading and ascending to 1 ft., green, flowers scented, ray white, disc yellow).

***Calotis glabrescens* sp. nov.**

Herba caulibus gracilibus parce ramosis ad 15 cm. altis vel brevioribus et subcaespitosis e caudice subterraneo perenni (rhizomate) orientibus, leviter costatis, pilis albis sparsissime obsitis. Folia angustissime lanceolata integra vel uno latere dente instructa, pilis albis sparsissime obsita, 3-6 cm. longa, 2-3 mm. lata. Capitula pedunculata, sub anthesi plana expansa; involucri phylla lanceolata, pilis strigosis plus vel minus sparse obsita, 3 mm. longa; ligulae numerosae, albae deinde purpureae, 6 mm. longae. Capitula fructifera densissima, sphaerica, diametro (aristis inclusis) 1 cm. lata. Achaenia obovata, lateribus leviter incrassata, aristis 3-5 inaequalibus retrorse barbatis et setis vel aristis reductis pluribus omnibus dense et longe albopilosis terminata.

Darling Downs: Bybera, between Inglewood and Milmerran, moderately common in open forest land, *C. T. White* 12623 (fig. and ftg. heads), Sept. 1944 (herb, flowers white turning purple when dying).

C. glabrescens is most closely allied to *C. suffruticosa* Domin but can be distinguished by the characters given in Section 15 of the dichotomous key.

***Calotis scabiosifolia* Sond. & F. Muell.** in Linnaea xxv, 471 (1852).

Calotis scapigera Hook. in Mitchell's Tropical Australia 75 (1852).

I have attempted to separate these two species in section 10 of the dichotomous key but failed to make the distinctions at all satisfactory. Several specimens collected by C. E. Hubbard in Queensland have all been distributed from the Royal Botanic Gardens, Kew (Eng.) as *C. scapigera* Hook., though following the key by Bentham in the "Flora Australiensis" and that of J. M. Black in "Flora of South Australia," I would have identified them as *C. scabiosifolia* Sond. & F. Muell. An examination of the types of the two species is highly desirable. It is extremely likely that we are dealing here with one polymorphic species. Bentham in the "Flora Australiensis" noted no less than five named varieties of *C. scabiosifolia* Sond. & F. Muell., an indication of great variability.

Calotis scabriuscula sp. nov.

Herba perennis erecta, scabriuscula, pilis plus vel minus crispis plerumque glandula minuta terminatis dense vestita; caules foliosi. Folia spatulata vel elliptica apice acuta vel subacuta basi sessilia vel in petiolum semiamplexicaulem gradatim angustata, margine in parte superiore dentata vel raro integra, 3-4 cm. longa, 0.7-1 cm. lata. Capitula pedunculata; involucri phylla lanceolata vel anguste ovata, acuta, 7 mm. longa; ligulae numerosae, albae, elongatae; capitula fructifera 1.7 cm. diam. Achaenia plana obovata hispido-muricata, 2.5 mm. longa, aristis 2 fere aequalibus quam achaeniis fere triplo longioribus basin versus leviter dilatatis, apicem versus retrorsum barbatis et squamis 2 oblati terminata.

Warrego District: Chesterton, approx. 25° 20' S., 147° 20' E., in *Callitris-Eucalyptus* forest on very sandy soil ca. 1,900 ft., S. T. Blake 11140 (flg. and ftg. heads), 8-4-1936 (erect more or less spreading branched annual up to 6 in., leaves subglaucous above, glaucous beneath, ray white, disc yellow).

The present species comes closest to *C. dentex* R. Br. but the two can be distinguished as follows:—

Pubescent or nearly glabrous; leaves linear or linear-lanceolate, very deeply toothed or almost pinnatifid in the whole length, sessile, base semi-amplexicaul, achene with 1 or 2 awns, in the latter case one markedly smaller than the other; a coastal or near coastal plant	<i>C. dentex.</i>
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Densely pubescent; leaves spatulate or elliptic, mostly narrowed at the base into a semi-amplexicaul petiole, toothed in the upper part or sometimes entire or nearly so, achene with 2 nearly equal awns; an inland plant	<i>C. scabriuscula</i>
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Calotis scabriuscula C. T. White var. *lobata* C. T. White var. nov.

Folia cuneata vel cuneato-spatulata, apice profunde lobata.

Darling Downs District: Eukey via Stanthorpe, Mrs. E. Goebels (ftg. heads), Nov. 1944.

This variety has the appearance of a large form of *C. cuneifolia* R. Br. but the fruiting heads are twice as large, as in *C. dentex* R. Br. and *C. scabriuscula* C. T. White, and the awns are only barbed at the ends, as in those two species.

***Calotis squamigera* sp. nov.**

Herba annua, caulibus ca. 10 cm. longis plus vel minus decumbentibus paucis obsitis, parce ramosis. Folia anguste spathulata basin versus in petiolum gradatim angustata, pilis albis subtus parce obsita, integra vel plerumque utroque latere dente acuminato instructa, ca. 1.5 cm. longa, 3 mm. lata, sed folia inferiora saepe elongata in petiolum longum attenuata, cum petiolo ad 6 cm. longa, 3 mm. lata. Capitula axillaria, numerosa, sessilia, flores ligulati pauci, 2 mm. longi: involucri phylla sparse hirsuta, lanceolata, 3 mm. longa. Capitula fructifera densissima, sphaerica, diam. cum aristis ca. 1 cm. Achaenia matura atro-castanea, cuneata, muricata, aristis 4 vel interdum 5 squamis oblongis vel fere rotundis 1 mm. latis alternantibus.

NEW SOUTH WALES.—Macintyre River, near Queensland border at Goondiwindi, *C. T. White* 12621 (TYPE: fig. and ftg. capitula), Sept. 1944.

QUEENSLAND.—Maranoa District: Bungeworgorai, nr. Roma, very common in sandy soil, *C. T. White* 9532 in part (ftg. capitula), Oct. 1933 (a common weed, local name "Bindi-eye"). Warrego District: Murweh, *R. Cameron*. North Kennedy District: Charters Towers, weed on race-course, *H. Flecker* (ftg. heads) 6-8-1942 (N.Q. Nat. Club 7925). Burke District: Maxwellton, on grassland, alt. abt. 550 ft., *S. T. Blake* 12650 (fig. heads), August 1936 (shortly creeping, ascending or erect, up to 4 in., green, flowers yellowish). Moreton District: Eight Mile Plains, nr. Brisbane, weed of cultivation introduced with sheep manure, *C. T. White* (fig. and young ftg. heads), 26-10-1930.

The Section *Cheiriloma* Benth. Fl. Austr. iii. 501 is characterised by the numerous flower-heads sessile in the leaf axils and the ray florets very inconspicuous. It contains only two species, *C. hispidula* F. Muell. and the present one. They are the true "Bindi-eyes" of inland parts though this term has become rather loosely applied to a number of burr plants. *C. squamigera* *C. T. White* and *C. hispidula* F. Muell. grow together and are difficult to distinguish in the field but can usually be separated at a glance in the dried specimens due to the more glabrous character of the burrs of the former. It is difficult to decide whether we are dealing with a species or variety, but as the characters are constant over a wide range the present plant seems worthy of specific rank. The differences between the two are given in section 15 of the accompanying key to the species of *Calotis*.

***Calotis suffruticosa* Domin** Bibl. Bot. lxxxix (viii), 1209 (1929).

Darling Downs District: Dalby, on open ground on dark brown clay, alt. abt. 1,100 ft., *S. T. Blake* 5921 (fig. and ftg. heads), May 1934 (tufted, more or less erect, flowers bright yellow). Mitchell District: Yalleroi, between Blackall and Jericho, in mixed open forest on reddish sand, alt. abt. 1,160 ft., *S. T. Blake* 6774 (fig. and ftg. heads), July 1934 (diffuse rather glaucous, flowers yellow; local name Bindie); Oakley, north of Longreach, on sparsely timbered low sandy ridge, alt. abt. 600 ft., *S. T. Blake* 11649 (fig. and ftg. heads), June 1936 (base woody, stems numerous, tufted spreading to erect ca. 6 in., plant rather deep green, fls. yellow) (a hispid and robust form). Leichhardt District: Emerald, on open sandy ground, alt. abt. 600 ft., *S. T. Blake* 6915 (fig. and ftg. heads), July 1934 (tufted, more or less spreading perennial (?), flowers bright yellow).

This species was only previously known from the type gathering near Jericho. Superficially it is very close to *C. lappulacea* Benth. but the two species can be distinguished by an examination of the achenes.

Achenes with a pappus of 4-8 unequal free awns *C. lappulacea*
 Achenes with a pappus composed of 2 awns and a number of very
 reduced ones or setae united at the base *C. suffruticosa*

Calotis xanthosoidea Domin Bibl. Bot. lxxxix (viii), 1209 (1929).

Mitchell District: East of Jericho, in mixed open forest on sand, alt. abt. 1,250 ft., *S. T. Blake* 6813 (fig. and fig. heads), July 1934 (tufted, prostrate, dull green, ray white, disc yellow); same locality and habitat, *S. T. Blake* 6827 (fig. and fig. heads), July 1934 (tufted, ascending, green, ray lilac, disc yellow); near Lochnagar, in Eucalyptus forest, on fine sand, alt. abt. 1,100 ft., *S. T. Blake* 10278 (fig. and fig. heads), Nov. 1935 (bushy dull green annual of abt. 6 in., ray white, disc yellow). 20 m. E. of Corinda Station in red sandy soil, *S. L. Everist* 2569 (fig. and fig. heads), April 1946 (erect herb; leaves pale dull green; ray florets white, disc yellow).

Gregory South District: Tenham Station, abt. 25 miles S.S.E. of Windorah, on stony ridge with *Acacia*, *S. T. Blake* 12033 (fig. and fig. heads), July 1936 (bushy subglaucous annual of abt. 6 in., ray light mauve, disc yellow).

Only previously known from the type gathering on sandstone hills of the Dividing Range, near Jericho.

Superficially this species is very similar to *C. cuneifolia* R. Br. but on the whole is larger in its parts. The two species, however, can immediately be distinguished by an examination of the achenes.

Achenes with a pappus composed of 2-3 barbed awns and 2
 truncate scales *C. cuneifolia*
 Achenes with a pappus composed of 6-8 barbed awns and at
 least 4 smaller scales *C. xanthosoidea*

Coreopsis lanceolata L. Sp. Pl. 908 (1753).

Burnett District: Kingaroy, in grassland about the town, *M. S. Clemens* (old fls. and ripe seed heads), 17-3-1944.

A native of North America, much cultivated as a garden perennial but subsontaneous around towns and settlements.

Helipterum uniflorum J. M. Black Trans. Roy. Soc. South Aus. xli, 651, pl. XLIII (1917).

Warrego District: Offham, on edges and sometimes in clay-pans in patches from a few square ft. up to 15-30 sq. yds. and only on very isolated spots, *N. Geary*, Sept. 1943.

Not previously recorded for Queensland.

Family GOODENIACEAE.

Goodenia subauriculata sp. nov. (Sect. *Eugoodenia*).

Herba humilis probabiliter perennis, pilis longis hispidis plus vel minus sparse obsitis; caulibus in sicco leviter complanatis et sulcatis ad 15 cm. longis. Folia linearia, apice acuta, basi subauriculata, margine irregulariter et distanter dentata vel fere lobata vel in foliis superioribus saepe integra, 3-9 cm. longa, 3-5 mm. lata, costa media supra impressa subtus elevata, nervis secundariis utrinque invisibilibus. Pedunculi

axillares uniflori 1 mm. longi vel sub fructu ad 2 mm. longi. Ovarium oblongum, 2 mm. longum. Sepala lanceolata ovario aequilonga. Corolla flava (Flecker), in sicco in specimine Tatei pallida et purpureo-venosa, extus pilis longis sparsis obsita, ca. 6 mm. longa; lobi 3 inferiores apicem versus alis instructi, lobi 2 superiores profunde separati inaequaliter alati. Stamina filamenta tenuia; antheris oblongis minutis minutissime apiculatis. Capsula oblonga, 5 mm. longa, sepalis 2 mm. longis coronata; semina in quoque loculo 1, rugulosa, margine valde incrassata instructa.

NORTHERN TERRITORY.—Pine Creek, *R. Tate* (TYPE: National Herbarium, Melbourne).

QUEENSLAND.—Cook District: Iron Range, *H. Flecker* (fls.), April 1944 (herb, fls. yellow) (N.Q. Nat. Club No. 8565).

According to Krause's Monograph of the Goodeniaceae (Pflanzenr. IV. 277) the present plant comes nearest to *G. sepalosa* F. Muell. and between that species and *G. hispida* R. Br. The three can be distinguished as follows:—

Herbs, more or less densely hispid, not at all glandular.

Leaves usually dentate, tapering into a petiole at the base,
peduncles shorter than the leaves or almost as long;
sepals leafy, longer than the ovary

G. sepalosa

As above, but peduncles very short or flowers sessile

G. sepalosa
var. *brachypoda*

Leaves usually dentate or lobed, sessile, base subauriculate;
peduncles short, 1-2 mm.; sepals lanceolate as long as
the ovary

G. subauriculata

Leaves usually entire, lower ones petiolate, upper ones
sessile; peduncles exceeding the cauline leaves; sepals
subulate, barely as long as the ovary

G. hispida

Dr. Flecker's specimen was forwarded to the National Herbarium, Melbourne, for comparison with type material of *G. sepalosa* F. Muell. and its variety *brachypoda*. The Director, Mr. A. W. Jessep, reported that it differed from *G. sepalosa* F. Muell. in the stem-clasping foliage, much smaller flowers and smaller calyx, not large and "leafy", but that it was identical with an unnamed specimen in the National Herbarium from Pine Creek, Northern Territory, and collected by R. Tate. This was kindly sent me on loan with permission to name and describe it if I thought fit.

Family CONVULVULACEAE.

Merremia hederacea (Burm. f.) Hallier f. in Engl. Bot. Jahrb. xviii, 168 (1894).

Evolvulus hederaceus Burm. f. Fl. Ind. 77, t. 30 f. 2 (1768).

M. convolvulacea Dennst. Schl. Hort. Malabar 39 (1818).

Cook District: Green Hill, near Cairns, *S. E. Stephens* (fls.) 19-5-1944 (herb, fls. yellow) (N.Q. Nat. Club No. 8713).

A common weed of S.E. Asia and the Malay Archipelago, not previously recorded from Queensland.

Family SCROPHULARIACEAE.

Limnophila fragrans (Forst. f.) Seem. Fl. Vit. 180 (1865).

Ruellia fragrans Forst. f. Prodr. 44 (1786).

Limnophila serrata Gaudich. Bot. Freyc. Voy. 448, t. 57, fig. 2 (1826); Benth. Fl. Austr. iv. 490 (1869).

Cook District: Hammond Islands, *F. M. Bailey* 127, June 1897 (herb with strong peppermint odour) (detd. and recorded as *L. gratioloides* R. Br.); Thursday Island, *F. J. C. Wildash*; nr. Clayton's Creek, growing in swamp among *Axonopus compressus*, *H. Flecker* 3-9-1944 (N.Q. Nat. Club No. 8841) (herb with highly aromatic odour).

Not previously recorded for Queensland.

***Limosella aquatica* L. Sp. Pl. 631 (1753).**

Darling Downs District: Wallangarra, *M. S. Clemens* (nearly ripe fts.), Nov. 1944.

Not previously recorded for Queensland.

Family PROTEACEAE.

***Conospermum longifolium* Sm. Exot. Bot. ii, 45, t. 82 (1806).**

Darling Downs District: Eukey via Stanthorpe, *Mrs. Goebels per M. S. Clemens* (fts.) Nov. 1944; Ballandean, *J. E. Young*.

Not previously recorded for Queensland.

***Grevillea linearis* R. Br. in Trans. Linn. Soc. x, 170 (1811).**

Darling Downs District: Eukey, nr. Ballandean, *Mrs. M. S. Clemens* (fts.), Nov. 1944.

Not previously recorded for Queensland. These specimens agree well with those from the type locality—Port Jackson.

***Grevillea arenaria* R. Br. in Trans. Linn. Soc. x, 172 (1811), var. *canescens* (R. Br.) Benth. Fl. Austr. v, 443 (1870).**

G. canescens R. Br. Prot. Nov. 18 (1830).

Moreton District: Murphy's Creek, *E. A. R. Lord* (fts.) March (few fts. and fruits—not quite mature) April 1944.

Mr. Lord writes: "The shrub is common in our ranges and blooms for the greater part of the year. It grows in the form of a spreading shrub and the average height is abt. 5 ft."

The present specimens are an excellent match for the illustration in Botanical Magazine tab. 3185 quoted by Benth. l.c. There are several small *Grevilleas* in the section *Ptychocarpa* and the distinctions between many are very meagre. The specimens quoted above and the illustration in the Botanical Magazine show one of the most outstanding of them and to my mind one of the most worthy of specific rank. An examination of recent abundant material with types is highly desirable, however, before making any changes from the arrangement by Benth. in the "Flora Australiensis," adopted by subsequent botanists.

Family LILIACEAE.

***Stypandra grandis* sp. nov.**

Caules ad 1 m. alti, parte inferiore infra inflorescentiam simplici ad 0.5 m. alta. Folia pauca ad 1 m. longa et 4 cm. lata, dimidio inferiore carinata, basi vaginante caules amplectentia et parte vaginale ad 10 cm. longa; folia caulina ad vaginas gradatim redacta. Inflorescentia laxa dichotoma in panicula terminali ad 30 cm. longa et 25 cm. lata disposita, bracteis sub ramulis praecipuis foliaceis et vaginantibus

superioribus gradatim redactis eis sub pedicellis 3-5 mm. longis. Pedicelli tenues 1.5-3 cm. longi. Perianthii segmenta cyanea 1 cm. longa, vix 5 mm. lata, intus lineis 5 elevatis longitudinaliter notata. Stamina petala ca. duplo breviora, filamentis tomento aureo dense vestitis. Capsula oblonga, 8 mm. longa; semina opaca, rugosa.

Darling Downs District: Stanthorpe, *F. M. Bailey* (fts.), Dec. 1875 (detd. as *S. caespitosa* R. Br.); Thulimbah, *C. Schindler*; Mt. Norman via Wallangarra, *Mrs. M. S. Clemens* (TYPE: fs.), Nov. 1944.

The present plant was previously recorded for Queensland as *S. caespitosa* R. Br. but differs in being very much larger. The two can be distinguished as follows:—

Plant under 0.5 m. high, leaves under 0.25 m. long and abt. 5 mm.	
wide, perianth segments blue, yellowish or white inside; seeds	
smooth and shining	<i>S. caespitosa</i>
Plant 1 m. high, leaves 4 cm. wide, perianth segments deep blue,	
yellowish or white inside, seeds dull, rough	<i>S. grandis</i>

Mr. R. H. Anderson, to whom I submitted specimens of the new species, thinking it might occur in the New England country, states that he has not seen the plant in New South Wales and considers it quite distinct from *S. caespitosa* R. Br., which is a common plant about Port Jackson. This latter species should be deleted from the Queensland Flora until authentic material has been gathered.

Family CENTROLEPIDACEAE.

Centrolepis strigosa Roemer & Schultes Syst. Veg. i, 43 (1817).

Darling Downs District: Near Wallangarra and Eukey, *Mrs. M. S. Clemens* (fts.), Nov. 1944.

Not previously recorded for Queensland. The closely allied *C. fascicularis* Labill. grows in the same area.

THE ORIGIN, DISTRIBUTION AND MODE OF OCCURRENCE OF MICA IN CENTRAL AUSTRALIA.

By H. I. JENSEN, D.Sc.

(Three Maps and Five Text-figures.)

(*Read before the Royal Society of Queensland, 27th August, 1945;
issued separately 20th January, 1947.*)

I. DEFINITION OF MICA.

Mica is mineralogically a general term applied to any one of a group of minerals which are of a very glistening lustre, and highly cleavable parallel with the basal plane. In commerce and industry the term is applied principally to one variety of mica, namely white mica or muscovite, though the darker brownish phlogopite is also in great industrial demand.

II. CHEMICAL NATURE OF THE MICAS.

The true micas form a peculiar group of primary hydrous silicates, in which an alkali oxide enters into combination with an oxide of aluminium, iron, or magnesium, and with silica, and a little water of constitution. The alkali may be potassium, lithium or sodium. The sodium-mica, paragonite, occurs in rocks as fine pearly scales, sometimes forming a compact mass of mica rock, but it is of no commercial importance as it does not form large plates. The lithium micas, lepidolite and zinnwaldite, are present as scales, or compact masses, in some gneisses and pegmatitic granites, but are of no commercial value, except for the extraction of lithium, for which purpose the occurrence would have to be exceptionally large since these micas contain only about 4 per cent. lithium. The commercially important micas are the potash micas, muscovite and phlogopite. Black mica, the iron-potash mica, mineralogically called biotite, is of no commercial importance, although it frequently occurs in pegmatite dykes as very large crystals, up to 12 inches or more in diameter, and cleaves well; it lacks the transparency and the dielectric properties which are measures of the value of mica. The micas in demand are muscovite, the potash-aluminium mica, and phlogopite, the magnesium-potash mica.

III. PROPERTIES AND USES OF THE COMMERCIAL MICAS.

The properties which give mica its present day wide commercial use and high value are its perfect basal cleavage into sheets often as thin as a thousandth of an inch, transparency or translucency, flexibility, elasticity, lustrous sheen of cleavage faces, low thermal conductivity, infusibility, and, for electrical applications, its dielectric property of high resistance to the passage of electricity. This last property, in conjunction with its low thermal conductivity and infusibility, accounts for the high and ever-increasing demand for mica, which is absolutely essential to the electrical industries in the manufacture of condensers, telephones, dynamos, commutators, sparking plugs and various types of heating equipment, in which the wires, or heating elements, are coiled round the mica.

Diagrammatic Sketch Plan
of the
PHLOGOPITE DYKE
showing the Geology.



Fig. 1.

Mica therefore possesses a unique combination of properties, unequalled by any other natural or manufactured substance. As the electrical industry is constantly expanding with the march of civilisation, the demand for mica is constantly increasing. In ancient and medieval times muscovite, or white mica, was in limited demand—on account of the size of sheets obtainable—for making windows and skylights. With the expansion of the metallurgical industry mica came into use for making windows in furnaces to enable the operator to see the progress of smelting, but even a generation ago the demand for muscovite was only moderate. To-day production cannot supply the demand. Consequently thinly split scrap mica, powdered mica, and fine mica from the concentration of mica in river sands (recovered by dredging or sluicing) are to-day employed in the manufacture of micanite, which is composed of fine mica plates, or powder, cemented with certain shellacs and gums, and compressed into sheets. Micanite can be used as a dielectric where temperatures are not excessively high.

Ground mica is also used as backing for rolled asphalt roofing, to prevent sticking; also to give lustre to paints and wallpaper, to give a finish to stucco and concrete, and as a dusting material to prevent rubber goods from adhering to the moulds in which they are cast, and for many other purposes.

A decade ago the market for mica was precarious, and in the hands of speculators. The miner who faced hardship and risk did not get a fair deal. These conditions are not likely to recur.

IV. MODE OF OCCURRENCE AND ORIGIN OF THE COMMERCIAL MICAS IN CENTRAL AUSTRALIA.

Phlogopite and muscovite are very different in their mode of occurrence and mineral associations.

A. PHLOGOPITE is a much rarer mineral than muscovite. It is in great demand for the manufacture of aeroplane spark-plugs and commutators.

While muscovite is a widespread mineral in acid igneous and metamorphic rocks, phlogopite is associated with basic igneous and metamorphic rocks, and occurs in them only sparingly and sporadically.

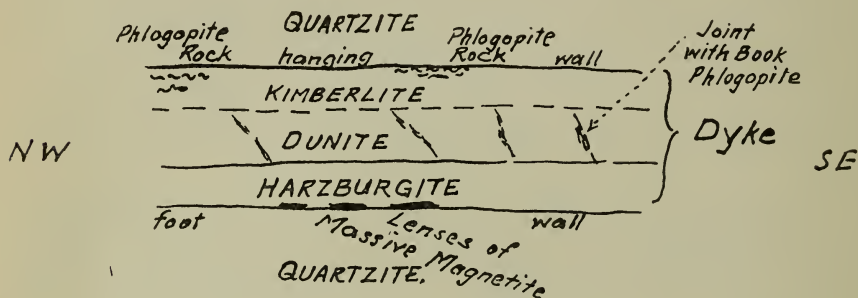
There is only one phlogopite mine in Central Australia. It is situated on the southern slope of the Strangway Range, a spur of the Hart's Range. (See plate I.) It was opened up by the Government in 1943, essentially because supplies of phlogopite from Madagascar and Canada were cut off through the war with Japan. The mineral was badly needed for Australian aeroplane manufacture.

The occurrence of phlogopite in this locality had been discovered some years earlier by a prospector named Johannsen. The find attracted some interest, and several government geologists had cursorily reported on it before me, but they did not have the advantage of examining the deposit after it had been properly opened up.

The phlogopite occurs in a dunite, a rock composed wholly of olivine. The geologists referred to above, Owen and Sullivan, regarded this dunite as an alteration product of dolomite, which according to them, had been intruded by a basic dyke (amphibolite). They attributed the

alteration of the dolomite to olivine and phlogopite to metamorphism caused by the basic dyke. My own examination of the area of the mine led me to entirely different conclusions, on which the following remarks are based.

The area is composed of a highly metamorphosed series, consisting of interstratified amphibolites (basic sills or altered basalts), felspathic quartzites, acid gneisses, basic gneisses and schists. This series is intruded by dykes of later amphibolite and, still later, by pegmatitic dykes of an acid magma. (See figure 1.)



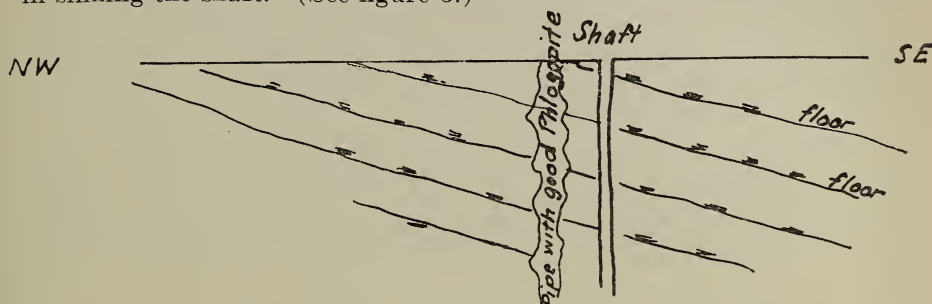
Horizontal Cross Section of the Phlogopite Dyke.

Fig. 2.

The phlogopite occurs in a large basic dyke allied to gabbro, which differentiated into three zones:—a harzburgite, consisting of hypersthene, bronzite, augite, enstatite and magnetite, with a little basic felspar and olivine, on the footwall side; an olivine rock in the middle; and gabbro, allied to kimberlite, on the hanging-wall side. (See figure 2.) The hanging-wall rock consists in some parts of olivine-augite rock with spinel, in some parts of the same minerals with some phlogopite. In places a rock consisting mainly of phlogopite has been developed. In the footwall part of the dyke there are also considerable lenses of pure magnetite. Whether this differentiation of the magma took place in its first cooling period or in the period of subsequent metamorphism is not clear.

The phlogopite dyke can be followed on the surface for about half a mile varying in width of outcrop between 50 and 200 feet. It strikes north-north-west, and appears to dip at a very high angle to the east-north-east. Towards its northern end it is faulted in an interesting manner by a pegmatite dyke. At two points on the outcrop, one near the north and one near the south end, occur some small outcrops of crystalline dolomitic limestone, which contributed to the idea that the dyke was altered limestone. These occurrences are, however, only secondary limestone. The gneissic series is variable in strike in the area, but mostly west-north-west in the neighbourhood of the dyke. The still later pegmatite intrusions branch considerably, but the largest strike east-north-east. Several small pegmatitic veins occur in the immediate neighbourhood of the phlogopite mine, but none have been noticed as yet in the basic dyke rocks. Several intrusions of a rock resembling aplite also occur in the vicinity, but this rock so closely resembles some of the adjoining metamorphic rocks (the felspathic quartzites) that its identity is doubtful.

The phlogopite (-bearing) dyke, on underground examination, is seen to have a large number of sub-parallel partings, or major joints, dipping gently to the south-south-east. In the weathered zone solutions penetrating along these joints have decomposed the olivine rock to form a pug consisting of magnesite, with nodules of magnesium silicate (saponite). Along these major joints, and in neighbouring branch joints, the best books of phlogopite were developed. Very abundant books of phlogopite also occurred in a pipe-like olivine formation, which went straight down only a couple of yards from the main shaft. It was missed in sinking the shaft. (See figure 3.)



*Longitudinal Cross Section of Phlogopite Dyke
showing Floors (Joints) along which
Book Phlogopite was developed.*

Fig. 3.

The parallel partings, joints, or floors in the dyke, which have permitted decomposition into secondary magnesian minerals, were probably also passages for solutions in the remote geological period when the pegmatites were injected. It would therefore appear from the study of this mine that phlogopite was not an original component of the dyke rock, but was formed by the action of solutions containing potash, emanating from granitic intrusions in the vicinity. Its occurrence in pipe-like bodies, as well as in proximity to the floors and joints mentioned, points to its being a pneumatolytic mineral. The occurrences of phlogopite rocks, consisting almost wholly of phlogopite, are sporadic, and mostly near one or other of the walls. They are probably portions very severely affected by hot solutions rich in potash. In these places the phlogopite has not been able to grow freely into large books, but occurs as intergrown crystals up to 1 or 2 inches in diameter.

A little fine-grained phlogopite also occurs in similar association in a large basic dyke known as the Black Pinnacle in the Hart's Range, and in metamorphosed limestone near Jenkin's apatite deposit, on the Hart's Range road, but no large books seem to exist in either locality.

The phlogopite mine (Johannsen's) was developed at great expense, but was abandoned in 1944, as soon as overseas supplies of the mineral could again be obtained. Owing to the sporadic occurrence of good books of the mineral, even in the best portions of the mine, the expense of mining it was not warranted. It is of course quite possible that further development of the mine may lead to the discovery of richer

ground. Moreover, only about a fourth of the dyke outcrop has been tested with shafts; and shallow rootings in the other portions show that phlogopite occurs right along it.

Before leaving the subject of the phlogopite mine and dyke some interesting mineral associations should be mentioned. At the point where the dyke has been faulted, and a later pegmatite dyke has been intruded into the fault, there is a large development of phlogopite rock, and lenses of anthophyllite rock also occur. A large mass of phlogopite rock has also been developed on the hanging-wall side of the phlogopite-dyke north-west of the main workings adjoining a supposed aplite intrusion, and several others south-east of the main workings—also near supposed aplite intrusions. Alteration of the gabbro to anthophyllite rock also occurs near the hanging-wall side south-east of the main shaft, and portions of the adjacent country rock here have been altered to actinolite rock. The production of anthophyllite and actinolite is probably due to fault movements, as these minerals occur in several sheared zones in basic rocks in other parts of the Hart's and Strangway Ranges. Whatever may be the origin of phlogopite in other countries, pneumatolytic processes seem best to account for its presence in the Strangway Range.

B. MUSCOVITE. Considering the plentiful and wide distribution of muscovite in rocks, it seems a strange thing that the mineral is so scarce in large books.

Muscovite is one of the major minerals in a considerable section of granite as well as of the gneisses and schists in the older formations throughout the world.

In large crystals (called books, on account of cleavability of the crystals and flexibility of the sheets) it occurs only in coarse granitic dykes, known as pegmatites; even in these rocks the mica books are sporadic, or in some cases confined to lenses within the dyke.

It is only in those pegmatite dykes which invade the oldest gneisses and crystalline schists of the earth's surface that sheet mica in commercial books is to be found.

The Hart's and Strangway Ranges (see plate I.) are, as described in my paper to this society last year, composed of Archæan formations, consisting of gneisses, amphibolites, quartzites, schists, marbled dolomitic limestones, and similar highly altered rocks, traversed by thousands of pegmatite dykes. Most of the pegmatites contain only mica up to an inch or two wide in cross section, quite useless for cutting up into sheets. Many pegmatites contain very little mica at all. Some contain sporadic lenses rich in sheet mica. Very few of the dykes contain large mica books throughout the whole length of outcrop.

These facts raise a number of important questions which are best dealt with separately. They are:—

- (a) What is the cause of the different nature of the granite-pegmatite dykes?
- (b) What is the effect of the country rock on the dykes?
- (c) What are the indications by which a prospector should be guided in his search for commercial mica?

These problems are dealt with separately in the following sections.

(a) *Cause of the different nature of the granite pegmatite-dykes.*

A large intrusion of igneous molten matter contains a considerable amount of water and various gases which become saturated with mineral matter. As the molten mass cools and crystallises out, the gases and watery solutions are squeezed into cavities formed within, or near, the apex of the cooling mass. If the enclosing rocks are sufficiently cool to develop fault cracks the gases may escape through these; with the gases some of the hydrous solutions may also get away. If the intruded rocks are devoid of cracks, as would be the case in that deep zone, the zone of metamorphism, where temperature and pressure keep the minerals in a plastic condition, the liquids and gases of the intrusion, together with a certain amount of mineral in solution, are kept confined until cooling has proceeded far enough in the enclosing rocks to allow the latter to crack or fault. When cracking does take place, whether through general earth movements, or through internal gas pressure, or through expansion caused by crystallisation, not only can the gases and liquids escape, but the release of pressure also liquifies part of the consolidated igneous rocks near by, and that too is squeezed into the crack.

Assuming that a granite mass is suddenly thrust into a well-cooled zone capable of cracking and faulting, normal granite and aplite dykes and grano-pegmatitic (very coarse granite) dykes are thrust into the cracks after the escape of solutions and vapours. The solutions and vapours would effect mineralisation thousands of feet and even miles away from the granite body. The less mobile dykes would gradually close up the fissures and vents. If the cooling granite body were very large there would still be pockets of mother-liquor, i.e., gases, liquids and mineral matter in solution, in parts of the intrusion. This liquor, being the last to solidify, would again be squeezed to the apex of the mass, where it would remain in a liquid and gaseous condition until further earth-movements caused further cracking and faulting, thus permitting its escape. But when the enveloping rocks are still plastic and undergoing the process of metamorphism the mother-liquor eats or stopes its way up through the plastic metamorphic formations, forming large irregular pegmatite dykes, until it reaches a zone which has attained a stage of cooling that has produced joints and faults. Then the mother-liquor will follow the channels of easy passage.

Thus we can from the same large granite mass get an earlier series of granite, aplite, and grano-pegmatitic dykes, and a later series of pneumatolytic pegmatite dykes formed from the residual magma. If release of pressure by great earth-movements should liquify a portion of the already cooled granite mass, there can be a still later series of porphyritic granite dykes.

The dykes containing books of sheet mica belong to the true pneumatolytic series formed by the invasion of the enveloping metamorphic rocks by masses of squeezed-out mother-liquor or residual magma. For the production of muscovite the mother-liquor must be highly potassic. Naturally this would most frequently occur in the case of a highly potassic granite magma; sometimes also in a normal granite magma in which differentiation and chemical combination have left potash dominant in the residual liquor.

Amongst the gaseous and liquid constituents of the mother-liquor carbon dioxide is the principal mineralizer. The others are water, chlorine, fluorine, and boron. These keep alkalis in solution. The carbonic acid is responsible for keeping a large amount of silica in the liquor, and the haloids account for the presence of various heavy metals. Consequently, when at the comparatively low temperature of between 500° and 1,000° C. the mother-liquor consolidates, it may contain a considerable number of minerals containing fluorine, chlorine and boron, as well as others in the formation of which the haloids play a part. Amongst such minerals are tourmaline, topaz, tin, wolfram, tantalite, &c.

A study of the pegmatitic dykes rich in sheet mica shows that most of them have quartz blows developed within them. Often such blows outcrop strongly on the surface. They contain no mica. Around each such quartz blow there is usually a zone of graphically intergrown quartz and felspar, a eutectic zone. Outside this there is a zone of massive crystalline felspar. The eutectic and felspar masses rarely contain any vestige of mica as inclusions. Odd interstitial veinlets of later origin may contain some mica.

When quartz blows are absent along the outcrop there are usually lenses or bands of quartz along the hanging-wall, and sometimes subsidiary bands within the dyke.

Around and between the quartz blows, as described, the main body of the dyke consists of a miarolitic coarse aggregate of quartz, felspar and mica, in which good books may be developed in a manner described later. Often the best books occur just outside the massive felspar, and moulded on the felspar.

The mica books often contain inclusions of other minerals such as tourmaline, rutile, quartz, felspar, &c., which spoil the value of the mica. The inclusions show that the sheet mica was the last mineral to form.

In normal granites the order of crystallisation is usually that of decreasing basicity. Mica commenced to crystallise before felspar, though it might continue to grow while the felspar was forming. Mass action and low content of pneumatolytic solutions are the causes of crystallisation, in accordance with decreasing basicity of minerals, in muscovite granite.

My predecessors in geological investigation on the mica field adopted the sequence of crystallisation of muscovite granite as that of pegmatites also. Hence they had to invent a second period of intrusion to account for the quartz blows.

Actually the order of crystallisation of pegmatite dykes is, according to my investigations, as follows:—

- (1) Quartz blows,
- (2) Eutectic intergrowth of quartz and felspar,
- (3) Massive felspar,
- (4) Miarolitic pegmatitic mixture of quartz, felspar and mica,
- (5) Mica and quartz.

The pegmatites do not follow the same order of crystallisation as granites but behave like hydrous solutions, under great temperature and pressure, but nevertheless much lower than those under which granites

crystallise. The pegmatites have formed at temperatures between $1,000^{\circ}$ C. and 500° C., the last solutions of potassic mother-liquor probably crystallising as mica and quartz at the last-mentioned lower temperature.

In crystallising, the order of crystallisation of pegmatites depends on the following combination of factors:—(a) specific gravity, (b) formula or molecular volume, (c) oxide volume, (d) pressure and temperature and (e) stress.

(a) and (b). Goodchild's researches into the physical chemistry of rock-forming minerals proved that minerals with the highest specific gravity and lowest formula volume crystallised out first. This accounts for the early crystallisation of minerals like rutile, magnetite, tourmaline and other minerals occurring as inclusions in pegmatite minerals, though most of these commenced to form early enough to be enveloped by and retained in the parent granite.

(c) As regards the feldspars, Goodchild found that the oxide volume was the most important factor controlling the order of their formation. Lime, with an oxide volume of 16.4 to 23.4, enters into combination before soda, with an oxide volume of 22 to 22.7. Therefore most of the lime is retained in the parent granite. But, as potash has the greatest oxide volume of the common alkalis, it remains in solution longest and is the last to enter into combination.

The mother-liquor from which the pegmatites are formed consists mainly of soda, potash, silica, and the various mineralisers already mentioned which hold in solution alumina, iron, and traces of other heavy metals. As the oxide volume of quartz (silica) is only 22.7 to 27, it is to be expected from Goodchild's work that it would start to enter into combination about the same time as the lime and soda and before the potash, at least in static solutions. In the Hart's Range pegmatites oligoclase and microcline, the soda feldspars, almost always formed before the potash feldspars.

(d) Pressure and temperature become important factors in the sequence of crystallisation. As stated before, carbon dioxide is, with alkali, responsible for holding large quantities of silica in solution. While the dyke is stopping its way upwards in plastic metamorphic rock of the deepest zone, it is under very high temperature and pressure, and the mineralisers are confined in it. As soon as it reaches cooler and fractured rocks—like those of Grubenman's Middle Zone—the carbonic acid is enabled to escape together with much of the water and haloid gas. The lowering of pressure, and concomitant lowering of temperature, and the loss of the solvent gases, cause an immediate precipitation of silica, which then closes the faults or cracks. The cooling of the magma now brings about further precipitation of quartz and feldspar as a eutectic and later the formation of feldspar. At this stage excess of silica has been reduced. The closing of fissures causes a renewed rise of temperature and pressure, and the hydrous potash-rich residual magma crystallises as quartz, feldspar and mica, but the excess potash and the remaining mineralisers hold in solution silica and alumina, but not in the proportion needed to form orthoclase. Then it is that this solution with falling temperatures precipitates mica and even corrodes feldspar and sometimes the wall rocks, to abstract the alumina necessary to crystallise out as mica and quartz.

(e) In the crystallisation of the final residual portion of the magma, formation of mica is favoured in preference to orthoclase, because its molecular volume is 140 to 142 as against orthoclase (98.7 to 109.4); and also through the fact that the cooling of the dyke has proceeded so far as to bring it into the zone of stress. Orthoclase is a deepest zone mineral, muscovite a middle zone or stress mineral. Mica is usually oriented in definite directions in regard to the wall of the dyke, indicating stress at the time of its deposition.

Normal orthoclase consists of SiO_2 64.7 per cent., Al_2O_3 18.4 per cent., K_2O 16.9 per cent.; and ordinary muscovite SiO_2 45.2 per cent., Al_2O_3 38.5 per cent., K_2O 11.8 per cent., H_2O 4.5 per cent. Since pressure increases solubility and release of pressure increases crystallisation, the escape of much of the CO_2 causes rapid deposition of felspar crystals as well as of excess silica, but when the escape vent is again sealed by quartz or quartz-felspar deposition pressure again increases. The lowering of temperature and pressure in the first place by escape of gas is practically equivalent to changing crystallisation conditions from those of the Lower Zone of Grubenman to those of the Middle Zone. That change favours the formation of mica instead of felspar. When pressure then again increases somewhat by the sealing up of vents of escape of liquid, and solubility increases, the remaining potassic mother-liquor, consisting largely of potash and water (caustic potash), will redissolve already formed felspar to form mica and quartz. The final solutions of redissolved felspar in potassic mother-liquor actually do not crystallise out into book-mica and quartz before pressure is again reduced by the cooling down of the enclosing wall rocks of the dyke. Magmatic water combined with potash also plays a very important part in the development of mica instead of orthoclase at the close of the consolidation period.

Wherever the texture of the dykes is fairly open and miarolitic, the mica may be somewhat evenly mixed with quartz and felspar in the last part to consolidate; but where the dykes are nearly flat, and crystallisation proceeded under great pressure, the final potash-rich solutions to enter into combination are squeezed towards the walls, near which the best book-mica occurs. The mica books often grow at the expense of already consolidated felspar, when the residual magma has become too low in aluminium even to form mica. Usually the hanging-wall side of the dyke has the best mica; sometimes both walls have good books. In the flat-dipping dyke of the Sister Mine at Carrara, on the south side of the Hart's Range, the best books lay in saucer-like depressions in the footwall, corroded out by the potassic liquors which formed the mica. In some mines there are also lines of small lenses of greisen-like composition, forming expansions of narrow greisen bands crossing from hanging-wall to footwall (as in the Kismet Mine, fig. 4) and these contain excellent book-mica. They suggest a fracturing of the consolidated portions of the dyke, and the squeezing of the potassic residual magma into the fractures. In some of the mines up Eldorado Creek (e.g. Oscari's Mine) there is clear evidence of felspar having been broken down, and mica developed at its expense, a greisen-like mixture of quartz and mica having formed by the action of the potassic solutions on already crystallised orthoclase.

This theory of the origin of mica is the only one which will stand critical examination in the light of facts observed in the mines. The order of crystallisation in the mica-rich pegmatites is therefore:—

1. Massive quartz.
2. Eutectic quartz and felspar.
3. Felspar,
4. Muscovite with or without residual quartz.



Cross Section of Kismet Dyke showing Mica developed on walls and in bunches along joints.

Fig. 4.

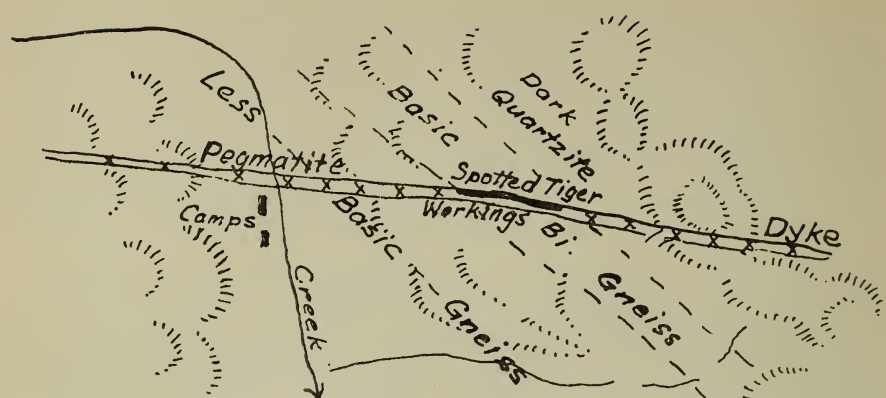
(b) Effect of Country Rock.

The nature of the dyke retinue of a parent intrusion of large size is largely dependent on the character of the rocks invaded. If the latter contain great beds, or bodies, of limestone, which is calcined, silicated and partly assimilated by the granitic mass, differentiation is promoted into dioritic and acid, calcic and alkaline granites, giving off dykes of different kinds. But the most important effect, from the point of view of mica-rich pegmatites, is that the alteration of limestones in the contact charges the acid portions of the granite differentiates with water and carbonic acid. These constituents favour the production of pneumatolytic dykes.

The pegmatite dykes themselves are also affected by the rocks which they encounter in working their way up either through a fissure or by the stopping process. Where they pass through limestones the consolidation and crystallisation of potash is delayed and the production of mica favoured above the calcic formation.

In the Spotted 'Tiger Mine, the most productive mica mine in the Territory, the pegmatite seems to be richer in book-mica where it lies between biotite gneiss walls than in the acid gneiss and quartzite. (See figure 5). This has also been a matter of general observation with most of the mines. Almost all the best mines are situated on pegmatites intruding basic gneiss and amphibolite. This is probably due to two causes—firstly, the open texture of the basic gneisses and amphibolites, which permits pent up carbonic acid from the intrusion to invade the formation; and, secondly, the greater susceptibility of basic minerals to alteration by carbon dioxide and moisture—they become carbonated and chloritised.

Dykes in very acid gneisses rarely contain payable mica, except when the gneisses are interbedded with limestone or amphibolite and these rocks occur nearby.



Showing Occurrence of Best Mica in Basic Gneiss.

Fig. 5.

Dykes in fine-grained schists, and in medium and coarse mica-schists in Central Australia, however rich in muscovite they may be, very rarely contain any book-mica of sufficient size and quality to warrant mining.

Coarse-grained wall-rocks, like coarse gneisses and amphibolites, favour the production of a coarse-grained pegmatite. Where a steeply inclined pegmatite dyke invades such rocks there is a tendency for large mica books to form alongside either wall, as well as along certain cross flaws in the body of the dyke.

The dykes also have a considerable influence on any basic country-rock which they traverse. There is a great development of garnet and of calcite veins. These are produced by the pneumatolytic solutions permeating the country-rock. Garnetiferous gneiss so often lines the mica-rich dykes that garnet can almost be considered as indication.

Highly potassic dykes which were charged with pneumatolytic solutions when injected, often metamorphose a selva of the country-rock traversed into an all-mica rock, resembling a muscovite-biotite schist, the schistosity of which is parallel to the dyke. This selva may range from a few inches to several feet in width. It can be seen lining the walls of many of the best mica-mines in the Territory, including the Spotted Tiger, and can be said to be indication of the dyke's favourable chemical composition for mica-production. Probably the dyke intrusion rendered the original gneiss composing this selva plastic. Potassic solutions from the dyke entered into combination with the plastic wall-rock and a complete rearrangement of minerals took place, the hornblende of amphibolite and biotite gneiss being changed to biotite and the feldspar to muscovite, with the principal axis of the crystals at right angles to the dyke.

Where mica-bearing pegmatites are not characterised by intermittent quartz blows along the outcrop there is usually a band of massive quartz near the hanging-wall side, and sometimes parallel bands within the dyke. This quartz deposition takes place as the vapours and solutions work their way into the country rock, escape of CO_2 being accompanied by deposition of SiO_2 . The various quartz bands may mark progressive stages in consolidation.

(c) Indications for the prospector.

From the foregoing considerations it appears that the pegmatite dykes which deserve most attention are:—

- (1) Principally pegmatite dykes intruding coarse-grained basic gneisses. On the other hand, large coarse granite (granopegmatitic) dykes do not merit much investigation.
- (2) All pegmatites which are very rich in muscovite, especially those which show some moderate or large books on the outcrop.
- (3) Pegmatitic dykes which have a zone or selvage of all-mica rock, resembling a minette, lining their walls. That indicates a potash-rich mother-liquor which has acted on the flucan and wall-rock, producing mica.
- (4) Pegmatitic dykes with intermittent quartz blows along the outcrop (like the Billy Hughes) and pipes with a quartz outcrop centrally situated (like the Caruso).
- (5) Pegmatite dykes which have produced an extensive development of garnet in the country-rock traversed by them.

From the considerations outlined in section (a) and (b) it can also be seen that the scarcity of large book-mica is due to a great number of special conditions which are necessary for its production. In addition it might be stated that a large proportion of the book-mica from most mica mines is only fit for grinding up as scrap mica, because many books have defects or flaws which wholly spoil the mica for use in sheets. The principal defects which condemn mica to the scrap class are (1) inclusions of other minerals, especially those which are fair conductors of heat and electricity, (2) the fishtail or herring-bone structure, and (3) ruling.

In fishtail or herring-bone mica the sheets are traversed by a number of radiating ribs, like those of a fan. This appears to be due to twinning, resulting from crystallisation pressure or strain at the time of formation. This type of structure predominates in large books developed around irregular quartz-felspar blows, instead of in parallelism to the lode direction.

Ruled mica is mica in which all the sheets are traversed by equidistant lines which look as if they were made with a parallel ruler. The ruling passes through every sheet of the book and is a plane of fracture. As the lines are usually less than half an inch apart they spoil the mica. The rulings represent a secondary cleavage parallel to a pinacoidal face, developed by tectonic pressure. This structure is very common in the mica of north-south pegmatite dykes near the western end of the Hart's Range where the strike of the country commences to change from east-west to west-north-west.

It has been pointed out that payable book-mica is often confined to particular lenses, or shoots, within the dyke, or plug. Mr. Archibald A. C. Dickson, M.E. (U.S.A.) and A.I.M.M. (London), in a small work called "The Mica Miners' Guide," which is based on his long experiences in India as a manager of mica mines, states that these lenses or shoots are always connected by a "bryle" or "indicator" which can be picked up by an experienced mica miner. Such indicator floors or veins have also been observed in several of the Territory mica mines, notably in those which (like the Kismet) have their best mica in greisen-like lenses.

Mr. Dickson found in India that the distance between successive shoots was usually approximately equal to the average length of the shoots.

In some of the Hart's Range mines, notably the Spotted Tiger and the Pannikin, the entire worked length has carried payable mica, and might be considered one shoot. Over 300 feet have been worked out in the Old Billy Hughes Mine, leaving only quartz and eutectic quartz-felspar blows as pillars. These occur with great frequency and regularity every 30 feet or so. The New Billy Hughes Mine is on a different shoot on the same lode higher up in the mountain.

Few of the mica occurrences have been followed up by exploratory work. The mica-bearing lens occurring on the surface has been worked out, and the mine has been abandoned as of no further use. "Where it be, there it be" has been the motto of the prospector.

Sporadic occurrence and apparently complete cutting out of "lode" is characteristic of all pneumatolytic minerals associated with pegmatites and deposited by emanations from pegmatites. It is the same with wolfram, tin, molybdenite. I have seen many tin mines in North Queensland which have been abandoned three or more times after a bunch of tin ore has been taken out, all trace of ore having vanished. Enterprising prospectors entering these "shows" often pick up clues which lead them to another bunch of ore. So it is with mica.

Mica apparently occurs in book form only in pegmatites in the crystalline gneisses and associated very old formations, because it is only in these formations that the plasticity of the rocks, caused by high temperature and pressure, has sealed up all cracks and fissures, thereby allowing pent up gases and mineralisers to act in the manner outlined.

V. MICA MINES OF CENTRAL AUSTRALIA.

(See plate II. and plate III.)

It is not within the scope of this paper to describe all the mica mines of the Territory or even to enumerate them. That has been done in my official reports, the principal of which may in due course be published by the government. The object of this paper is to bring to light certain conclusions of a theoretical nature, based on observations, conclusions which could not be properly and fully dealt with in official reports.

There are many hundreds of muscovite mines in the Hart's Range (see plate II.), most of them worked to a standstill and abandoned. The most notable of these is the Spotted Tiger Mine, which has twice in its history been abandoned as useless, only to be taken up again and found richer than ever. It has produced over 300 tons of fine commercial mica, not clear mica, but spotted; and it is still producing.

Nearby is the Billy Hughes Mine, at an elevation of about 3,000 feet above sea level, on the steep slopes of Mt. Palmer, in the central portion of the Hart's Range metamorphic complex. On and near the slopes of the same mountain are the Disputed, the Rex, the Spotted Dog, the Ulgarna, the Caruso, the Rising Sun, and many smaller deposits. About four miles north-east of Mt. Palmer, on the slopes of Mt. Brady, are situated the Central mine and many smaller "shows." East and west of these centrally situated important mines, for a distance of 30 to 40 miles either way, i.e., both east and west, the hillsides are studded with mica mines, and serap-mica carried by the wind sparkles in the sun

here and there on the steep slopes far away from the dumps, which, when the sun falls at the right angle on them, glitter like diamonds. Almost all the principal mica mines of Central Australia are situated in the Hart's Range and in similar rock formations along the Plenty River north of the Hart's Range. A few pegmatite outcrops carrying a little book-mica have been found in odd gneissic outcrops in the region of Barrow Creek, and in a few places north of the Strangway Range. The latter have been worked to some extent and have yielded a small quantity of mica, but all other micaceous pegmatites have been found not worth working.

The Plenty River mines (see plate III.) were only scratched until the Government took over the development of one of the groups, the Ajax Group. A strange theory existed amongst the old Italian, and other, mica miners to the effect that no mica mines are of any value unless they occur high up in the ranges. The Plenty River deposits were regarded by them only as pockets which would not live in depth. This idea is, of course, quite nonsensical, and the government work done in the Ajax Group, and later work by a private syndicate in the Dinkum mine, show it to be so. In the steep ranges the mica deposits are eroded and exposed, so that they are easily seen and the dykes are easily traced. The quality of the mica is good from the outset, since there is no considerable superburden of decomposed rock in which the mica has undergone deterioration. Tunnels or adits can be driven, and the waste rock slides down the mountain-side and does not encumber the workings. These are the advantages of the mountain mines. But there are serious disadvantages. The slopes are generally far too steep for any vehicular road to be made to the mine. In a number of cases it is impossible even to get a camel-track or a mule-track to it. There is no ground level enough to pitch a camp. The miners sometimes live a thousand feet or more lower down. Tools and timber, food and fuel have to be hauled by manpower up the steep slithery and rocky slopes. It is impossible to get drilling machinery, winches and petrol up. Consequently the work is carried on in the most primitive and arduous fashion. Every morning and night the men climb up or down carrying or dragging tools sharpened or to be sharpened, mica won during the day, and so on—a task more arduous than the hard labour in the mines.

The mines in the low-lying flat to gently undulating country, as along the Plenty River, have the disadvantages of the outcrops being largely covered up with soil and difficult to trace, and of the pegmatite being acted on by wet-season water sufficiently to damage much of the mica down to water level, at 50 feet, or more, in depth. On the other hand the advantages of mines so situated are very great. Roads can be carried right up to them, and rock drills, engines, machinery, timber, tools of all descriptions, explosives and necessities for the miners, can be landed by truck at the very site where they are required. Consequently work can be carried out cheaply by the most labour-saving machinery and modern methods. It does not take long to sink a shaft to the undecomposed dyke rock.

In 1943 and 1944 the government rendered good service in constructing, by means of graders, a number of very good roads to various points situated centrally to the mica mines of the Hart's Range and Plenty River. It also had a number of bores sunk which gave the miners water supplies more reliable than those few natural holes and springs, which had previously supplied them. Very useful work was also done

in sinking shafts and driving crosscuts to develop some of the principal abandoned mines. However, the objective of getting mica to pay for this work was not attained, because the mining methods adopted were quite unsuitable, much valuable mica being damaged or destroyed by indiscriminate machine-drilling and the excessive use of explosives.

The experienced mica miner always examines his drillings, and he also knows when his drill touches a mica-book by the toughness of the boring.

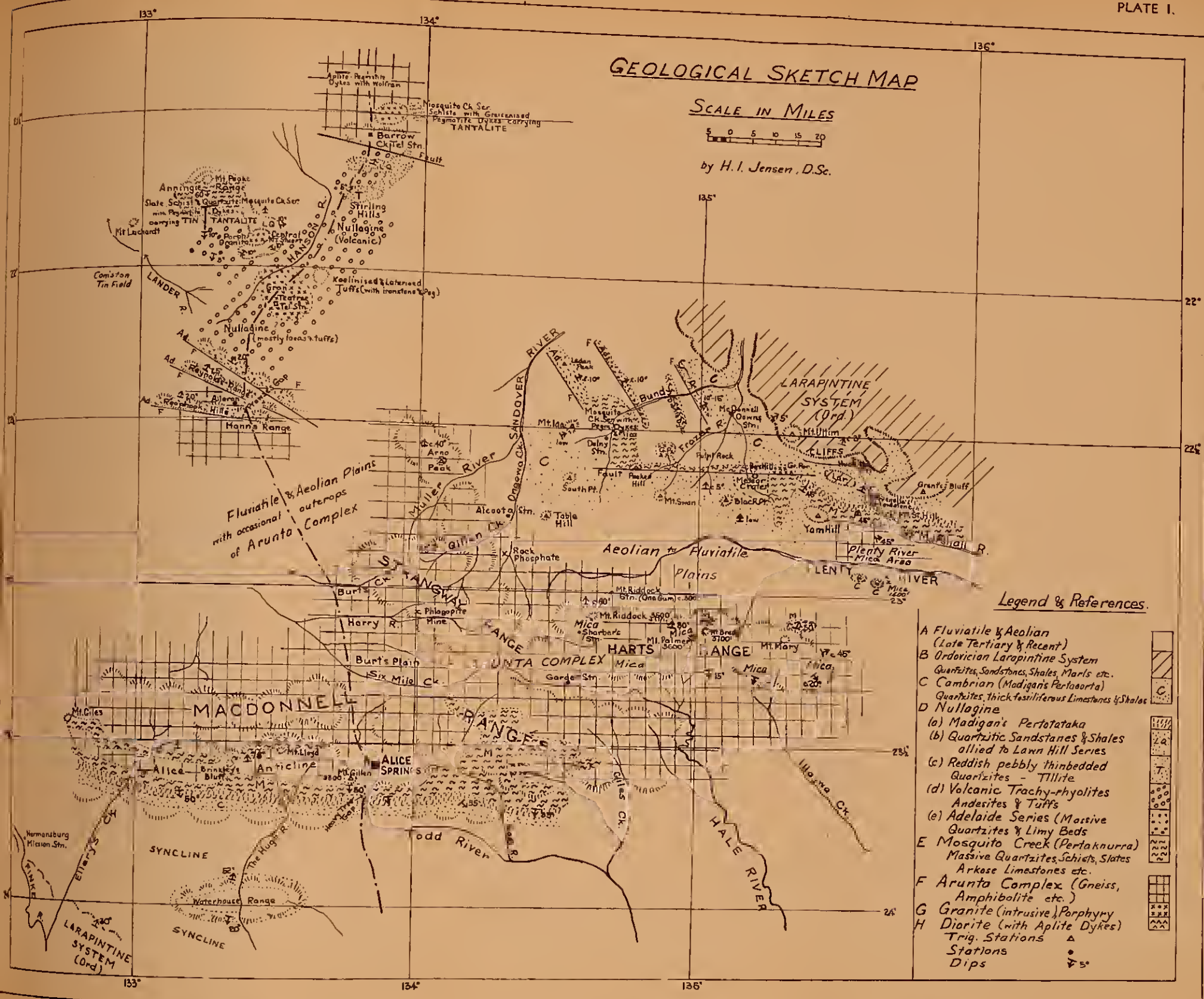
It may be wondered why there are no productive mica mines in the far northern portions of the Territory, as in the Pine Creek to Maranboy region. The rocks there are also very old Pre-Cambrian, and numerous pegmatite dykes from adjoining granite masses occur in them. The explanation is that the Pre-Cambrian rocks of the far north consist of slates, fine-grained sericitic and mica-schists, quartzites and related rocks, but they seldom contain any coarsely crystalline rocks, like the gneisses and amphibolites of Central Australia. The Pre-Cambrian rocks of the far north belong to Grubenman's Middle Zone series of metamorphic rocks. They were cool and much fractured at the time of the granitic invasions, and therefore the gases and solutions escaped easily instead of playing the intricate part involved in producing book mica.

VI. THE FUTURE OF MICA MINING.

There are many who think that Australian mica deposits will soon become worked out. There is nothing to warrant this outlook. As the Hart's Range region becomes more accessible, and cost of transport lower, and as scientific methods of searching for mica become more and more adopted, a large number, if not most, of the abandoned mines will yield new lenses, and many of the pegmatitic deposits may be worked to great depths.

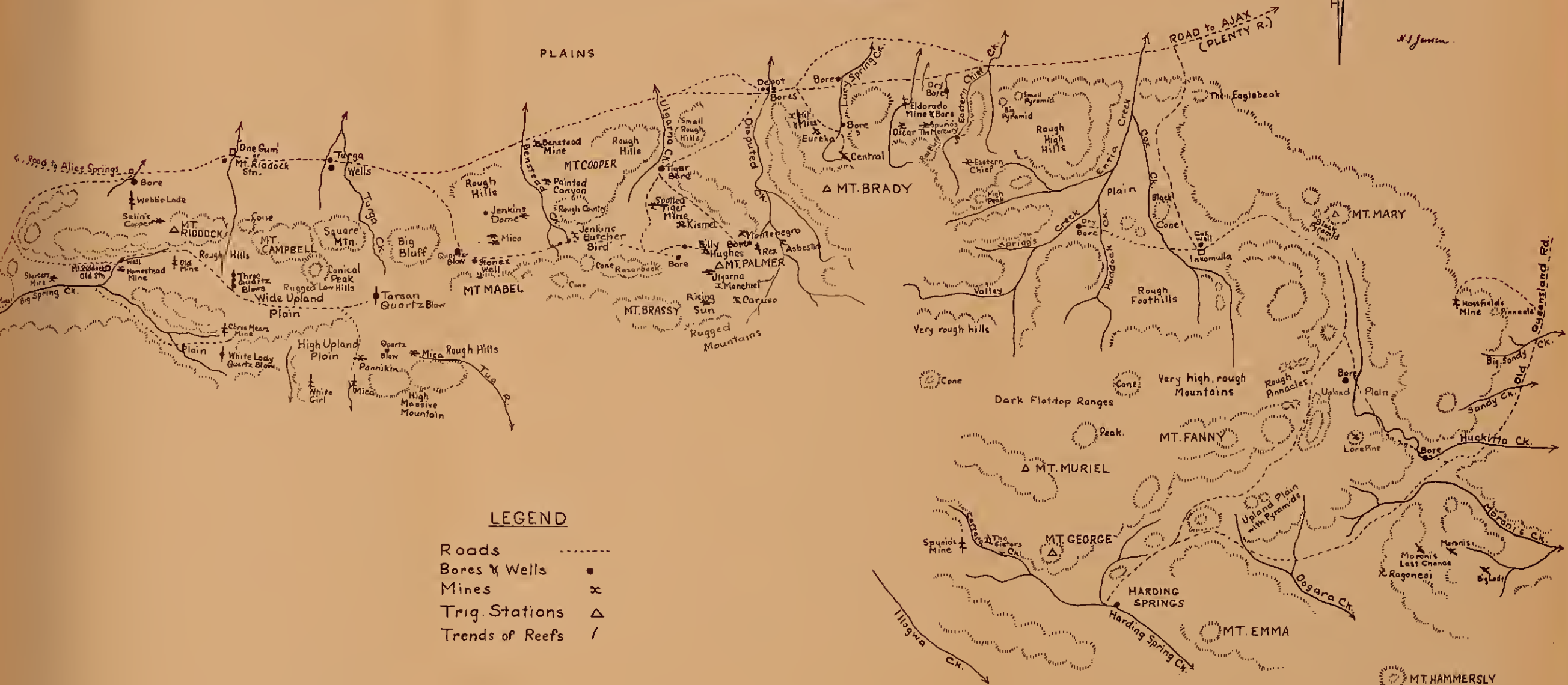
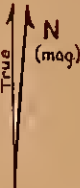
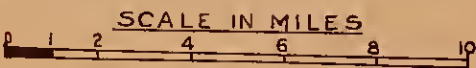
Diamond drilling may also greatly help in the discovery of new lenses.

The mica deposits cannot be worked out, but they can be worked to a standstill and become abandoned through continuing the old system of surface scratching without developing on intelligent lines.



Geological Sketch Map of the Harts Range and adjacent country (including part of Dr. Madigan's Survey of the Macdonnell Ranges).

TOPOGRAPHICAL MAP
OF
HARTS RANGE MICA REGION



Topographical Map of the Harts Range Mica Region showing all the principal Mica Mines.



Topographical Map of the Plenty River and Moroni's Mica Region showing the principal Mica Mines.

NOTES ON AUSTRALIAN MUSCOIDEA, VI.

CALLIPHORA IN AUSTRALIA AND NEW ZEALAND.

By G. H. HARDY, Department of Biology, University of Queensland.

(Received 13th October, 1945; accepted for publication, 29th October, 1945; issued separately 20th January, 1947.)

Compared with European and North American species, the Australian Calliphoras have a diverse appearance causing early authors to regard them as belonging to several distinct genera. Each important constituent in this fauna has been given one or more generic names, and colour seems to have been the chief recognition factor. More modern authors have attempted to advance beyond this plan. W. S. Patton (1934-5) adopted *Calliphora sensu lato* as his basis of study and he used a few characters of the terminalia for purposes of subdivision, resulting in the formation of three groups, each containing species diverse in appearance and structure. D. Miller (1939), taking a very conservative view, regards the terminalia as being liable to variation, and thus small differences used for subspecific determination are inconstant; at best he could admit only two subgenera in New Zealand, based upon bare and hairy eyes which admittedly gradate from one to the other. Hardy (1937), using colour characters for main divisions, attempts subdivision on such terminal characters as might run parallel with colour, thus keeping together species that are obviously related.

The New Zealand fauna falls into three divisions, namely, *Calliphora* with one introduced species, *Neopollenia* with two species, and all the rest included under *Neocalliphora*, being limited to these islands; whilst the orange or yellow thoracic spiracle can be used for subgeneric discrimination. The Australian *Onesia* species possibly form a complex, and if so, a few may have affinities with *Neocalliphora*; but terminal characters, more detailed than those given by Miller, are needed. The Australian *Adichosia* also seems closely related to *Neocalliphora*.

The following generic names have been proposed for these two faunas:—

Onesia Desvoidy 1830: type *Musca sepulchralis* Meigen, Europe.

This name has precedence over *Calliphora*, and the range of the genus probably includes Australia but not New Zealand. In the present studies the name is used for convenience.

Calliphora Desvoidy 1830: type *Musca erythrocephala* Meigen, Europe.

? *Anastellorhina* Bigot 1885: type *bicolor* Bigot, Australia. This is said to be *C. augur* Fab., but Townsend, who saw the type only through the glass of the cabinet drawer, may have seen *Lucilia fergusonii* Patton, which needs close examination to distinguish it from *C. augur*.

Neopollenia Brauer 1889: type *Musca stygia* Fabricius, Australia.

Neocalliphora Brauer & Bergenstamm 1891: type *Musca quadrimaculata* Swederus, New Zealand. Originally based on its hairy eyes and covered *Adichosia*.

Adichosia Surcouf 1914: type *Ochromyia hyalipennis* Macquart (preocc.); Tasmania is the quoted type-locality, but probably it was from Sydney; and the fly is generally regarded as being *Calliphora ochracea* Schiner, the species being misquoted as the type of *Neocalliphora* by various recent authors.

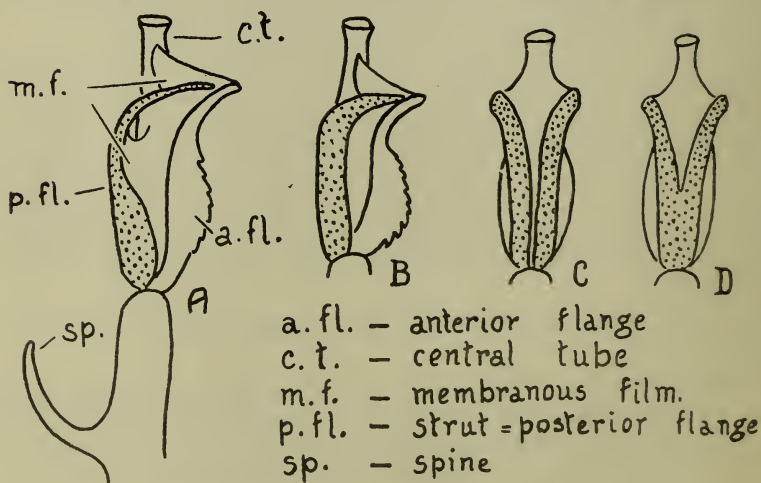
Proekon Surcouf 1914: type *Ochromyia lateralis* Macquart, Australia. The species is generally understood to be *C. augur* Fab., and the name may be a synonym of *Anastellorhina*.

Trichocalliphora Townsend 1915: type *C. villosa* Desvoidy, Australia. This is presumed to be *C. stygia* Fab., and later Townsend placed the name as a synonym of *Neopollenia*.

Paracalliphora Townsend 1916: type *C. oceanica* Desvoidy, Oceanic islands and Australia. The identity of the type is not known, but Townsend based his description on specimens which are presumed to be *C. augur* Fab. The generic name is a synonym of *Proekon*, and hence possibly of *Anastellorhina*.

Xenocalliphora Malloch 1924: type *C. eudypti* Hutton (preocc.), New Zealand. The species is now known as *X. viridiventrif* Malloch, of which only the female is known.

Philonesia Bezzi 1927: type *Pollenia aureonotata* Macquart, New Zealand, which is a synonym of *C. hortata* Walker.



EXPLANATION OF TEXT-FIGURES.

The diagrams represent the main features in the structure of the second segment of the aedeagus, and the form taken by the struts (posterior flange), which are stippled. Figs. A and B are as seen from the lateral position, and figs. C and D as seen posteriorly.

A illustrates a free strut detachable from the socket in the anterior flange. Each has a membrane (m.f.) that joins it to the central tube (c.t.), at the apex of which occurs the genital orifice. The basal segment of the aedeagus is also given to show the spine (sp.).

B shows the strut as normally found, bound in with the rest of the aedeagus; and such struts occur in two forms, shown in:—

C, with the struts separated one from the other; and

D, with the struts fused together at their base, the length of fusion varying with the species.

KEY TO SUBGENERA OF CALLIPHORA BASED UPON CHARACTERS IN THE AEDEAGUS.

1. Struts free at the apex and separated from each other at the base
(as in figs. A and C respectively) 2
Struts fused for their full length with the central tube of the
aedeagus 3
2. Struts tapering to a pointed apex to where the attached membrane
reaches. *Adichosia* and probably *Neocalliphora*. ✓
Struts similar but the attached membrane is short (as in fig. A).
Neopollenia stygia-group.
Struts expanded at the apex and the attached membrane short.
Calliphora. ✓
3. Struts distinctly separated at their base (as in fig. C).
Neopollenia (other groups) and *Proekon*.
Struts fused together at their base for an appreciable distance (as
in fig. D but varying in length of fusion with the species).
Onesia.

Only some of the species of *Onesia* have been examined for the cited character and these conform, but it seems possible that gradations will be found in the future leading to *Neocalliphora*.

Subgenus ADICHOSIA.

On *C. ochracea* Schiner, the aedeagus has its apical segment hinged in the normal way upon the basal segment which carries the spine (fig. A, *sp.*). The apical segment is in the form of a membranous central tube with the genital orifice at its apex, and is supported by four flanges, the bases of which are embedded in the membrane whence they arise and spread slightly outwards, retaining connection with the tube by membrane (fig. A, *m.f.*) partly filled with fatty matter that gives rigidity to the whole segment. The rear pair of flanges is in the form of a pair of highly chitinised struts (stippled in the figures), adjacent at their base, and ending in a curve that brings the apex of each strut into a socket on the anterior flange. The anterior flanges arise from the base and flank that bulging part of the central tube which pulsates when in action, and similarly they curve forwards, each ending in a point anteriorly directed. Another membrane is attached to these, joining them to the apical part of the central tube.

Comparing this with *C. erythrocephala* and allied species, Patton (1935) described the aedeagus as having "the struts slender and ending in a similar expansion, but not free as on the European and American species; the ends attached to membrane." If by this is meant not free from the anterior flange, then Patton evidently misunderstood the structure; further, the strut does not end in a similar expansion, but tapers to a point, as his drawing shows. The membrane attached to the strut differs from that of *C. erythrocephala* and also of the *stygia*-group (fig. A, *m.f.*) by reaching the apex of the strut, but this in no way alters the relation between the strut and the anterior flange other than by making it not so easy to detach. This character has been confirmed on a male captured in Brisbane on the 5th July, 1945, the struts being released from their socket without breaking that attached membrane, the shape being like that of Patton's drawing where it is traceable as slightly sinuous and without trace of an expansion. Patton gives two drawings of the condition on *C. erythrocephala*, in both of which the strut is shown as disconnected from the socket on the anterior flange; and the figure by Miller shows the strut retained in the socket.

Subgenus NEOPOLLENIA.

On the *stygia*-group, the strut can be very readily released from its socket, and the membrane attached stops far short of the apex as seen in fig. A. In all other groups the struts are fused with the central tube for their whole length as in fig. B, just as they are on all species of *Proekon* yet examined.

Brauer and Bergenstamm (1891, p. 440) state "*stygia* Schin. Nov. *Calliphora*, Sydney. = *vittata* Macq. (*Pollenia*).". I fail to trace *P. vittata* Macquart, nor have I seen further references to it, so I presume this is a manuscript name.

An error occurs in the key to species (Hardy 1937, p. 19) where *fulvithorax* should read *fulvicoxa*; also one species needs a new name, which is given below.

Calliphora (*Neopollenia*) *maryfulleri* new name.

Musca australis Boisduval 1835, Voy. l'Astrolabe Ent. ii. 669—preoccupied by Gmelin in Linn. Syst. Nat. ed. 13, i (1790), 2833.

Being unable to find a valid name for this well-known Western Australian species, I have chosen one for it to commemorate the late Mary E. Fuller, who carried out research on blowflies in Western Australia and discovered this fly in the process.

A CORRECTION.

In figure 25, on page 63 of the *Proceedings of the Royal Entomological Society of London*, series A, vol. 19, 1944, an error has been made by inadvertently placing the sclerite formation of *Sarcophaga* around the aedeagus of *Calliphora*.

On *Sarcophaga*, part of the sixth tergite and sternite are withdrawn into the genital cavity and form the entrance to the phallic pouch, as shown in that figure. There is no seventh tergite. Another remnant of the sixth tergite has been traced by Patton in a very small sclerite between T_5 and S_7 , and this seems to be all the sclerite remnant preserved in that position.

On *Calliphora* there is a considerable sixth tergite between T_5 and S_7 , but the chitinous border of the phallic pouch has lost both tergite and sternite. Instead, the pouch entrance is bordered below by the seventh tergite (T_7) and no sclerite is present to mark the upper limits of the phallic pouch. Thus it will be seen that in the original condition, as on Syrphidae, the phallic pouch lies in the lateral area of the sixth segment, having the lateral edge of the tergite and sternite to mark the border of indentation. This is preserved on *Sarcophaga*, but it is lost on *Calliphora*, where the phallic pouch is altered by the seventh tergite marking its posterior limit.

REFERENCES.

- BRAUER, F., & BERGENSTAMM, J. V. (1891). Densk. Akad. Wiss. Wienn., lviii: 440.
 HARDY, G. H. (1937). Proc. Linn. Soc. N.S. Wales, lxii: 17-26.
 ——— (1940). Proc. Linn. Soc. N.S. Wales, lxxv: 484-493.
 MILLER, D. (1939). Cawthron Institute Monographs, No. 2: 68 pp.
 PATTON, W. S., & CUSHING, E. C. (1934). Ann. Trop. Med. & Parasit., xxxviii: 205-16.
 PATTON, W. S. (1935). Ann. Trop. Med. & Parasit., xxxix: 19-32, and 200.

REVISION OF THE AUSTRALIAN PSYCHIDAE (LEPIDOPTERA).

By A. JEFFERIS TURNER, M.D., F.R.E.S.

(Received 29th October, 1945; accepted for publication, 26th November, 1945; issued separately, 20th January, 1947.)

This small family is in some respects the most specialised of the Lepidoptera; but it also presents many primitive characters. The larvae dwell in silken cases often with twigs or leaves attached. In these they pupate. The adult female is without wings, feet, and mouth-parts, and never leaves its case, in which the eggs are deposited. In the male the head is rough-haired, the tongue is absent, the palpi very short and hairy, the wings usually thin-scaled and often mostly hyaline. The neurulation is primitive, with a median vein (usually stalked) in the cell, and with second cubital and two anal veins in both wings; but there may be added various anastomoses, and also veinlets or pseudoneuria may be developed. The second cubital usually runs into the combined anal veins in the forewings, but may be undeveloped except near its base. The second median in the forewings arises below the middle of the cell. The first radial may be present in the hindwings. The anterior tibiae often have a long ventral spine.

KEY TO GENERA.

1. Anterior tarsi with basal joint not elongate ..	2	
Anterior tarsi with basal joint one-half	5	
2. Forewings with 9 absent	3	
Forewings with 9 present	4	
3. Hindwings with 4 and 5 stalked or coincident		<i>Elinostola</i>
Hindwings with 5 separate		<i>Hyaloptila</i>
4. Hindwings with 5 absent		<i>Hylarcta</i>
Hindwings with 5 present		<i>Paracharactis</i>
5. Hindwings with 4 and 5 anastomosing		<i>Clania</i>
Hindwings with 4 and 5 not anastomosing	6	
6. Antennae simple towards apex		<i>Oeceticus</i>
Antennae pectinate to apex	7	
7. Hindwings with 5 absent		<i>Phasmyalea</i>
Hindwings with 5 present	8	
8. Both wings with median forked		<i>Bathromelas</i>
Both wings with median not forked		<i>Plutorectis</i>

1. Gen. ELINOSTOLA Meyr. & Low.

Tr. R.S.S.A. 1907, p. 193.

Antennae bipectinate to apex. Forewings with Cu_2 running into combined anal vein, 4 and 5 stalked, 7 and 8 stalked, 9 absent; median forked in cell. Hindwings with 4 and 5 stalked or coincident, 6 absent; median in cell not forked. Type: *E. hypomela*.

1. *ELINOSTOLA HYALINA* n.sp.

ύαλινος, glassy.

22 mm. Head fuscous; face and palpi whitish. Thorax, abdomen and legs dark fuscous. Forewings elongate, costa moderately arched, apex round-pointed, termen rounded, oblique; transparent; costal edge narrowly fuscous. Hindwings with apex rounded, termen straight; transparent; costal edge and cilia fuscous.

NORTH AUSTRALIA: Darwin (F. P. Dodd); one specimen.

I have not seen any other species of this genus.

2. *ELINOSTOLA AGRIODES* Meyr.

Exot. Micro. ii, p. 472.

QUEENSLAND: Brisbane.

3. *ELINOSTOLA PANAGRIA* Meyr.

Exot. Micro. ii, p. 473.

QUEENSLAND: Brisbane.

4. *ELINOSTOLA HYPOMELA* Meyr. & Low.

Tr. R.S.S.A. 1907, p. 193.

QUEENSLAND: Brisbane.

2. Gen. *HYALOPTILA* nov.

ύαλοπτιλος, glassy-winged.

Antennae pectinate to apex. Anterior tarsi with basal joint not elongate. Forewings with 4 and 5 stalked, 7 and 8 stalked, 9 separate, 10 and 11 absent; median vein in cell not forked. Hindwings with cell long; all veins present and separate; median vein in cell not forked.

5. *HYALOPTILA MELANOSOMA* n.sp.

μελανοσωμος, black-bodied.

28 mm. Head, thorax, and abdomen dark fuscous. Antennae dark fuscous; pectinations 10. Legs fuscous. Forewings with costa straight to middle, thence arched, apex rounded, termen straight, oblique; wholly transparent; cilia fuscous. Hindwings with termen rounded; transparent; some fuscous hairs in dorsal area; cilia fuscous.

NORTH QUEENSLAND: Cape York in October (W. B. Barnard). Type in Queensland Museum.

3. Gen. *HYALARCTA* Meyr. & Low.

Tr. R.S.S.A. 1907, p. 193.

Antennae pectinate to apex. Anterior tarsi with basal joint not elongate. Forewings with Cu_2 running into combined anal vein, 5 absent, 7 stalked with 8, 9, and 10 sometimes stalked; median vein in cell not stalked. Hindwings with 5 absent, 6 and 7 approximated or coincident; median vein in cell not forked. Type: *H. nigrescens*.

6. *HYALARCTA NIGRESCENS* Dbld.

Thyridopteryx nigrescens Dbld. Eyre's Exped. i, p. 437; Meyr. and Low. Tr. R.S.S.A. 1907, p. 194.

Oiketicus herrichii Westw. P.Z.S. Lond. 1854, p. 232; Macalister Proc. Nat. Hist. Soc. Dublin 1869, p. 130; Wlk. iv, p. 950.

Hyalarcta ptiloclada Meyr. and Low. Tr. R.S.S.A. 1907, p. 195.

I have examined the type of *H. ptiloclada*.

QUEENSLAND: Toowoomba, Cunnamulla. NEW SOUTH WALES: Lismore. VICTORIA: Gisborne, Narnargoon, Kewell. SOUTH AUSTRALIA: Adelaide.

7. *HYALARCTA HUEBNERI* Westw.

Oiketicus huebneri Westw. P.Z.S. 1854, p. 288; Meyr. and Low. Tr. R.S.S.A. 1907, p. 195.

Oiketicus careyi Macalister. Proc. Nat. Hist. Soc. Dublin 1867, p. 133.

QUEENSLAND: Brisbane, Toowoomba, Stanthorpe. NEW SOUTH WALES: Sydney. VICTORIA: Gisborne, Melbourne, Beaconsfield. SOUTH AUSTRALIA: Adelaide. WEST AUSTRALIA: Perth.

4. Gen. *PARACHARACTIS* Meyr. & Low.

Tr. R.S.S.A. 1907, p. 205.

Antennae pectinate to apex. Anterior tarsi with basal joint not elongate. Forewings with 4 and 5 stalked, 7 and 8 stalked, 10 sometimes stalked with them. Hindwings with 4 and 5 connate. Type: *P. cautopsis*.

I do not know any species of this genus, which should be distinguished from *Plutorectis* by the basal joint of the anterior tibiae not being elongate.

8. *PARACHARACTIS LEWINII* Heyl.

Ann. Soc. Ent. Belg. xxix, p. 148; Meyr. & Low. Tr. R.S.S.A. 1907, p. 205.

NEW SOUTH WALES: Broken Hill.

9. *PARACHARACTIS CAUTOPSIS* Meyr. & Low.

Tr. R.S.S.A. 1907, p. 205.

NEW SOUTH WALES: Newcastle.

10. *PARACHARACTIS ERIONOTA* Low.

Tr. R.S.S.A. 1901, p. 63; Meyr. & Low. Tr. R.S.S.A. 1907, p. 206.

NEW SOUTH WALES: Broken Hill.

11. *PARACHARACTIS DELOCEPHALA* Meyr. & Low.

Tr. R.S.S.A. 1907, p. 206.

NEW SOUTH WALES: Sydney.

5. Gen. CLANIA Wlk.

iv, p. 963.

Antennae pectinate to apex. Anterior tarsi with basal joint elongate (one-half). Forewings with Cu_2 running into combined anal vein, 4 and 5 stalked, 7 connate with 8, 9, which are stalked. Hindwings with 4 and 5 stalked, 7 and 8 usually anastomosing before apex. Median vein forked in cell in both wings. Type: *C. lewinii* Westw.

12. CLANIA DEWITZI Heyl.

Ann. Soc. Ent. Belg. 1886, p. 119; Meyr. & Low. Tr. R.S.S.A. 1907, p. 196.

NEW SOUTH WALES: Sydney. TASMANIA: Launceston. SOUTH AUSTRALIA: Pinnaroo.

13. CLANIA TENUIS Rosen.

Ann. Mag. Nat. Hist. (5) xiv, p. 422; Meyr. & Low. Tr. R.S.S.A. 1907, p. 197.

NEW SOUTH WALES: Sydney. VICTORIA: Gisborne, Melbourne, Geelong, Beaconsfield, Stawell. TASMANIA: Launceston. SOUTH AUSTRALIA: Mt. Lofty, Pt. Lincoln.

14. CLANIA IGNOBILIS Wlk.

Char. Undesc. Lep. p. 67; Meyr & Low. Tr. R.S.S.A. 1907, p. 197.

NORTH QUEENSLAND: Cairns, Mt. Isa. QUEENSLAND: Brisbane, Toowoomba, Dalby. NEW SOUTH WALES: Murrurundi, Scone, Sydney. VICTORIA: Gisborne, Melbourne, Warburton. TASMANIA: Triabunna. SOUTH AUSTRALIA: Adelaide, Mt. Lofty. WEST AUSTRALIA: Perth.

15. CLANIA LEWINII Westw.

P.Z.S. 1854, p. 231; Meyr. & Low. Tr. R.S.S.A. 1907, p. 198.

NEW SOUTH WALES: Katoomba. VICTORIA: Melbourne, Gippsland. SOUTH AUSTRALIA: Mt. Lofty.

16. CLANIA PHOTIDIAS Meyr. & Low.

Tr. R.S.S.A. 1907, p. 199.

NORTH QUEENSLAND: Cairns.

17. CLANIA VARIEGATA Snel.

Tijd. Ent. xxii, p. 114; Hmps. Moths Ind. 1, p. 291 = *layardi* Moore Lep. Ceyl. ii, p. 102 = *pryeri* Leach P.Z.S. 1888, p. 598 = *sikkima* Moore Ind. Mus. Notes ii, p. 67 = *sciogramma* Turn. Tr. R.S.S.A. 1914, p. 247.

As noted by Hampson, the neuration of this species is variable. In one example from Perth the anastomosis between veins 7 and 8 of the hindwings is present, in three from Darwin these veins are unconnected. In the latter several costal pseudoneuria are developed in the hindwings.

NORTH AUSTRALIA: Darwin, Melville I., Bathurst I., King R. Also from Archipelago, China, Ceylon, India.

18. CLANIA PERSIMILIS n.sp.

persimilis, very similar.

30 mm. Head, thorax, abdomen, and legs fuscous. Antennae blackish; pectinations 12. Forewings narrow, costa straight to two-thirds, thence arched, apex obtusely pointed. termen nearly straight; 4 and 5 stalked to beyond middle; pale fuscous; veins outlined with blackish; cilia fuscous. Hindwings with termen nearly straight; thickly scaled; pale fuscous; cilia fuscous. Very similar to *C. tenuis*, but the wings are much more thickly scaled and not translucent. In the latter species veins 4 and 5 of the forewings are stalked near their bases.

NORTH AUSTRALIA: Bathurst I. (G. F. Hill); one specimen. Type in National Museum.

6. Gen. OECETICUS Guild.

Tr. Linn. Soc. 1827, p. 375; Meyr. & Low. Tr. R.S.S.A. 1907, p. 199.

Antennae simple towards apex. Anterior tarsi with basal joint elongate (one-half). Forewings with Cu_2 running into combined anal vein, 4 and 5 stalked, 7, 8, 9 stalked; median vein forked in cell. Hindwings with 4 and 5 stalked; median vein forked in cell. Type: *O. kirbyi* from Central America.

19. OECETICUS ELONGATUS Saund.

Tr. R.S. 1847, p. 43; Meyr. & Low. Tr. R.S.S.A. 1907, p. 200.

QUEENSLAND: Brisbane, Tweed Heads, Toowoomba, Dalby. NEW SOUTH WALES: Scone, Sydney. VICTORIA: Melbourne, Beaconsfield, Birchip.

20. OECETICUS TERTIUS Templ.

Tr. E.S. 1847, p. 39 = *templetoni* Westw. P.Z.S. 1854, p. 234 = *ulias* Low. P.L.S.N.S.W. 1899, p. 83.

NORTH QUEENSLAND: Cooktown, Cairns.

7. Gen. PHASMYALEA nov.

φασμυαλεος, like phantom glass.

Antennae pectinate to apex. Anterior tarsi with basal joint elongate (one-half). Forewings with 4 and 5 stalked, 8 and 9 stalked. Hindwings with cell long (two-thirds); 5 absent. Median vein in cell not stalked in both wings.

21. PHASMYALEA PELLUCIDA n.sp.

pellucidus, transparent.

25 mm. Head and thorax fuscous. Antennae fuscous; pectinations 12. Abdomen reddish-ochreous. Legs fuscous; tarsi grey-whitish. Forewings rather narrow, dilated posteriorly, costa gently arched, apex and termen rounded; transparent and scaleless except for a slight sprinkling of minute fuscous scales in terminal area; costal edge whitish to one-third, thence fuscous; terminal veins and cilia fuscous. Hindwings with termen rounded; as forewings.

QUEENSLAND: Bunya Mts. in April (W. B. Barnard); one specimen. Type in Queensland Museum.

8. Gen. BATHROMELAS nov.

βαθρομελας, black-based.

Antennae pectinate to apex. Anterior tarsi with basal joint elongate (one-half). Forewings with 4 and 5 stalked, 7, 8, 9 stalked; median vein in cell forked. Hindwings with 4 and 5 approximated throughout; 6 and 7 remote; median vein in cell forked. Monotypical.

22. BATHROMELAS HYALOSCOPA Meyr. & Low.

Tr. R.S.S.A. 1907, p. 203.

32 mm. Head pale grey. Antennae blackish; pectinations 6. Thorax fuscous; tegulae grey. Abdomen and legs blackish. Forewings triangular, costa straight, termen rounded; transparent; a broad blackish basal fascia giving off broad costal and dorsal lines to beyond middle and a slender line on lower edge of cell; cilia fuscous. Hindwings with termen nearly straight, slightly waved; transparent; base and costal edge blackish; cilia fuscous. Unless the structural characters are noted, this species might be referred to *Hyalarcta*.

QUEENSLAND: Injune. VICTORIA: Wimmera.

9. Gen. PLUTORECTIS Meyr. & Low.

Tr. R.S.S.A. 1907, p. 201.

Antennae pectinate to apex. Anterior tarsi with basal joint elongate (one-half). Forewings with 4 and 5 connate or stalked, 7 sometimes stalked with 8 and 9, which are stalked. Hindwings with 4 and 5 approximated, stalked or coincident. Median vein in cell simple in both wing. Type: *P. boisduvalii*.

23. PLUTORECTIS PANTOSEMNA Turn.

P.L.S.N.S.W. 1931, p. 342.

WEST AUSTRALIA: Lennox.

24. PLUTORECTIS MELANODES Meyr. & Low.

Tr. R.S.S.A. 1907, p. 201.

NORTH AUSTRALIA: Darwin. NORTH QUEENSLAND: Cape York, Townsville, Mackay. QUEENSLAND: Bundaberg, Brisbane, Tweed Heads, Dalby.

25. PLUTORECTIS XANTHOCHRYSA Meyr. & Low.

Tr. R.S.S.A. 1907, p. 202.

NORTH AUSTRALIA: Darwin. NEW SOUTH WALES: Jervis Bay. VICTORIA: Moe. WEST AUSTRALIA: Waroona, Perth.

26. PLUTORECTIS ZOPHOPEPLA Meyr. & Low.

Tr. R.S.S.A. 1907, p. 203.

NORTH QUEENSLAND: Cooktown, Townsville, Mackay.

27. PLUTORECTIS BOISDUVALII West.

P.Z.S. 1854, p. 232; Meyr. & Low. Tr. R.S.S.A. 1907, p. 202.

NEW SOUTH WALES: Sydney, Katoomba, Jervis Bay. SOUTH AUSTRALIA: Mt. Lofty.

28. *PLUTORECTIS CROCOBATHRA* n.sp.

κροκοβαθρος, with saffron base.

25 mm. Head fuscous. (Antennae missing.) Thorax orange-yellow. Abdomen fuscous. Legs ochreous; anterior pair fuscous. Forewings rather narrow, costa straight, apex and termen rounded; 4 and 5 separate, 6 and 7 connate from end of cell; pale fuscous; near base ochreous; cilia pale fuscous. Hindwings with termen strongly rounded; 4 and 5 connate; pale fuscous; cilia pale fuscous.

NORTH QUEENSLAND: Atherton in June; one specimen. Type in National Museum.

29. *PLUTORECTIS FULVA* n.sp.

fulvus, tawny.

28 mm. Head brownish-orange; face paler. Antennae with stalk whitish; pectinations 10, dark brown. Thorax and abdomen brownish-orange. Legs brownish-ochreous. Forewings broad, costa straight, apex and termen rounded; fuscous-brown, darker near base; cilia pale ochreous. Hindwings with termen strongly rounded; dark brown; cilia pale ochreous.

P. boisduvalii and *P. xanthochrysa* differ from this species in their blackish antennal pectinations.

NORTH AUSTRALIA: Darwin (G. H. Hill); two specimens. Type in National Museum.

30. *PLUTORECTIS DYSMORPHA* n.sp.

δυσμορφος, unattractive.

28 mm. Head whitish-ochreous. Antennae fuscous; pectinations 6. Thorax whitish-ochreous with central fuscous suffusion. Abdomen whitish-ochreous. Forewings elongate-triangular, costa straight to near apex, apex obtuse, termen slightly rounded, oblique; grey; dorsal area whitish-ochreous; a broad suffused fuscous bar from beneath one-third costa towards tornus; cilia fuscous. Hindwings and cilia fuscous.

NORTH QUEENSLAND: Cape York in October (W. B. Barnard); one specimen. Type in Queensland Museum.

31. *PLUTORECTIS GRISEA* Heyl.

Ann. Ent. Soc. Belg. xxix, p. 120; Meyr. & Low. Tr. R.S.S.A. 1907, p. 204.

QUEENSLAND: Emerald. NEW SOUTH WALES: Sydney, Broken Hill.

32. *PLUTORECTIS GYMNOPHASA* Low.

P.L.S.N.S.W. 1900, p. 39; Meyr. & Low. Tr. R.S.S.A. 1907, p. 204.

QUEENSLAND: Stanthorpe. NEW SOUTH WALES: Murrurundi, Sydney, Broken Hill. VICTORIA: Melbourne, Ararat, Castlemaine.

33. *PLUTORECTIS PELLOCEROS* Turn.

Tr. R.S.S.A. 1932, p. 188.

NORTH-WEST AUSTRALIA: Roeburne, Wyndham.

34. *PLUTORECTIS LURIDA* Heyl.

Ann. Soc. Ent. Belg. 1886, p. 120; Meyr. & Low. Tr. R.S.S.A. 1907, p. 204.

= *muris-olens* Luc. Tr. Nat. Hist. Soc. Q. 1894, p. 105.

NORTH QUEENSLAND: Cape York, Cairns. QUEENSLAND: Duaringa. Gympie, Brisbane, Injune. VICTORIA: Warburton.

35. *PLUTORECTIS CAPNAEA* n.sp.

καπναίος, smoky.

22 mm. Head, thorax, abdomen, and legs blackish. Antennal pectinations 6; blackish. Forewings with costa straight to three-fourths, thence slightly arched, apex rounded, termen slightly rounded; fuscous; cilia fuscous. Hindwings with termen strongly rounded; fuscous; cilia fuscous.

VICTORIA: Mt. Buffalo, in January; one specimen. Type in National Museum.

36. *PLUTORECTIS PAURA* n.sp.

παυρος, small.

16 mm. Head, thorax, abdomen, and legs blackish. Antennal pectinations 8; blackish. Forewings narrow, costa slightly arched, apex rounded, termen nearly straight, oblique; rather thinly scaled; pale fuscous; cilia pale fuscous. Hindwings with termen strongly rounded; fuscous; cilia fuscous.

QUEENSLAND: Brisbane in September (F. P. Dodd); one specimen. Type in National Museum.

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CONTRIBUTIONS TO OUR KNOWLEDGE OF AUSTRALIAN MICROLEPIDOPTERA.

By A. JEFFERIS TURNER, M.D., F.R.E.S.

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Fam. CARPOSINIDAE.

CARPOSINA HYPERLOPHA n.sp.

ὕπερλοφος, high-tufted.

♂, 28 mm. ♀, 36–38 mm. Head grey ; face whitish. Palpi in male 4, in female 8 ; fuscous mixed with whitish. Antennae whitish with fuscous annulations ; ciliations in male 1. Thorax and abdomen fuscous mixed with whitish. Legs fuscous with whitish rings ; posterior tibiae wholly whitish. Forewings elongate, dilated posteriorly, costa moderately arched, apex rounded, termen obliquely rounded ; whitish thickly sprinkled with fuscous and grey ; five rows of fuscous brown tufts of raised scales edged whitish posteriorly, two before middle, one median, and two after middle ; costal and terminal series of fuscous dots ; cilia grey with narrow fuscous bars. Hindwings and cilia whitish-grey.

QUEENSLAND : Burleigh (Tweed Hds.) in September (W. B. Barnard) ; three specimens. Type in Queensland Museum.

CARPOSINA POLIOSTICHA n.sp.

πολιοστιχος, grey-lined.

♂, 30 mm. Head whitish. Palpi 5 ; grey, upper edge of second joint whitish. Antennae grey-whitish with dorsal fuscous bars ; ciliations in male 1. Thorax and abdomen grey-whitish. Legs grey-whitish ; anterior pair fuscous with whitish rings. Forewings elongate, costa slightly arched, apex rounded, termen rounded, slightly oblique ; whitish ; markings grey sprinkled with fuscous ; a sub-basal inwardly oblique line from costa ; five fuscous costal dots ; an inwardly oblique line from near first dot towards one-fourth dorsum ; a narrow suffused fascia from fifth dot to tornus ; several terminal dots ; cilia whitish. Hindwings and cilia whitish.

QUEENSLAND : Burleigh in September (W. B. Barnard) ; one specimen.

CARPOSINA TRIGONOGRAMMA n.sp.

τριγωνογραμμας, marked with a triangle.

♀, 16 mm. Head and thorax grey. Palpi 4 ; fuscous, upper edge grey. Antennae whitish-ochreous annulated with fuscous. Abdomen grey ; dorsum of basal segments whitish-ochreous. Legs fuscous with whitish tarsal rings ; posterior tibiae mostly whitish. Forewings narrow, costa slightly arched, apex rounded, termen obliquely rounded ; whitish sprinkled with grey, more densely towards base ; a large fuscous triangle on costa from one-third to near apex, reaching half across disc, its apex opposite two-thirds dorsum ; a slender interrupted terminal line ; cilia grey-whitish. Hindwings and cilia pale grey.

QUEENSLAND : Bunya Mts. in March (W. B. Barnard) ; one specimen.

CARPOSINA SYSCIODES n.sp.

συσκιωδης, shaded.

♂, 22 mm. Head white. Palpi 4; fuscous, upper edge white. Thorax white with four anterior blackish dots. (Abdomen missing). Legs fuscous; posterior pair grey; tarsi with white rings. Forewings narrow, dilated posteriorly, costa nearly straight, apex rounded, termen obliquely rounded; white; dorsal and terminal areas widely suffused with grey; a grey costal line from base to apex; a blackish subdorsal dot near base, another larger beneath costa near base, one at one-fifth beneath fold, a dot above fold at one-fourth, and a median dot shortly before middle; a slightly curved blackish line from beneath two-thirds costa to near tornus; a terminal line; cilia grey. Hindwings in male with large dense cubital pecten; pale grey; cilia pale grey.

WEST AUSTRALIA: Denmark in March (W. B. Barnard); one specimen.

CARPOSINA AUTOLOGA Meyr.

P.L.S. N.S.W. 1910, p. 149.

The cubital pecten in the male is large and dense.

WEST AUSTRALIA: Denmark; Perth; Geraldton.

CARPOSINA OLBIODORA n.sp.

ὀλβιοδωρος, blissful.

♂, 18 mm. Head and thorax white. Palpi 2 and a half; white, outer surface of second joint except apex dark fuscous. Abdomen whitish. Legs fuscous with whitish rings; posterior tibiae whitish. Forewings narrow, slightly dilated, costa slightly arched, apex rounded, termen obliquely rounded; white; a fuscous costal line from base to one-fifth; a large irregular blotch on dorsum from one-fourth to middle, extending above fold, where it is produced posteriorly, its anterior edge blackish; four blackish dots on costa from one-third to two-thirds; a median blackish dot beneath costa; a transversely elongate brownish spot beyond this; a subterminal brown shade; four blackish submarginal dots around apex; a broad interrupted grey terminal line; cilia grey, bases and apices whitish. Hindwings and cilia grey-whitish.

QUEENSLAND: Toowoomba in November (W. B. Barnard); one specimen.

CARPOSINA TANAOPTERA n.sp.

ταναοπτερος, long-winged.

♀, 22 mm. Head and thorax whitish. Palpi very long (8); whitish with some fuscous scales, lower edge broadly fuscous. Antennae grey, towards base whitish. Abdomen pale grey. Legs fuscous with whitish tarsal rings; posterior tibiae whitish. Forewings elongate, costa slightly arched, apex round-pointed, termen strongly oblique; whitish; centre of disc suffused with fuscous and brownish; five fuscous costal dots from two-fifths to apex; slight subterminal suffusion; an interrupted fuscous terminal line; cilia grey. Hindwings and cilia pale grey.

TASMANIA: Mt. Wellington 2,500 ft. in January (W. B. Barnard); one specimen.

CARPOSINA CERAMOPHANES n.sp.

κεραμοφανης, like earthenware.

♀, 26 mm. Head brown-whitish. Palpi very long (8); dark fuscous, upper edge brown-whitish. Antennae grey. Thorax brown-whitish with four minute dark fuscous dots, two posterior and one on each tegula. Abdomen brown-whitish. Legs fuscous; posterior pair brown-whitish. Forewings elongate, narrow, slightly dilated, costa slightly arched, apex pointed, termen straight, strongly oblique; brown-whitish sprinkled with fuscous on costal edge and on a small area in mid-disc; 7 or 8 dark fuscous dots, one subdorsal near base, one median slightly beyond it, sometimes one on costa at one-eighth, one on fold at one-fourth and another beneath fold before it, one in middle of disc and two placed obliquely on end of cell; a series of minute terminal dots; cilia grey. Hindwings and cilia pale grey.

QUEENSLAND: Toowoomba in August (W. B. Barnard); one specimen.

CARPOSINA LOXOLOPHA n.sp.

λοξολοφος, with oblique ridge.

♂ ♀, 16-17 mm. Head and thorax whitish. Palpi 6; upper half whitish, lower fuscous. Antennae pale grey; ciliations in male 1 and a half. Abdomen whitish. Legs whitish; anterior pair fuscous. Forewings narrow, costa slightly arched, apex pointed, termen straight, oblique; whitish sprinkled with fuscous; an oblique dark fuscous bar from beneath one-third costa to above one-fourth dorsum crossing fold; a broad median fuscous suffusion; cilia grey-whitish. Hindwings and cilia grey-whitish.

WEST AUSTRALIA: Denmark in April (W. B. Barnard); five specimens. Type in Queensland Museum.

CARPOSINA DASCIOPTERA n.sp.

δασκιοπτερος, dark-winged.

♂ ♀, 18-19 mm. Head and thorax grey. Palpi 5; upper half grey, lower fuscous. Antennae fuscous; ciliations in male 1. Abdomen grey-whitish. Legs fuscous; posterior pair whitish. Forewings narrow, costa nearly straight, apex obtuse, termen oblique; fuscous; some whitish suffusion at two-thirds and before termen; an interrupted dark fuscous terminal line; cilia grey. Hindwings and cilia grey-whitish.

WEST AUSTRALIA: Perth in August; four specimens received from Mr. W. H. Mathews.

PARAMORPHA TENUISTRIA n.sp.

tenuistrius, with slender lines.

♂ ♀, 12-16 mm. Head and thorax white. Palpi 7; fuscous, upper edge white. Antennae white with pale fuscous annulations; ciliations in male 2. Abdomen grey; tuft whitish. Legs grey; posterior pair whitish. Forewings narrow, costa gently arched, apex acute, termen straight, very oblique; white with numerous slender fuscous lines between veins; six minute dark fuscous dots, first subdorsal near base,

second at one-fourth on fold, third beneath one-third costa, fourth beneath middle of costa, fifth at three fifths, sixth beneath it; an interrupted dark fuscous marginal line around apex and on termen, not reaching tornus; cilia white. Hindwings and cilia white.

WEST AUSTRALIA: Denmark in March and April (W. B. Barnard); two specimens. Type in Queensland Museum.

Fam. BLASTOBASIDAE.

BLASTOBASIS MONOZONA Low.

Tr. R.S.S.A. 1907, p. 170.

This is, I believe, a synonym of *B. tarda* Meyr.

BLASTOBASIS PALLESCENS n.sp.

pallescent, pale.

♂, 10–12 mm. ♀, 10–14 mm. Head and thorax pale ochreous-grey. Palpi in male stout, obtusely pointed, fuscous; in female slender, acute; grey, with apex of second joint whitish, or wholly whitish. Antennae pale grey; in male serrate. Abdomen pale grey. Legs whitish; anterior pair fuscous. Forewings narrow, costa nearly straight, apex pointed, termen extremely oblique; whitish sprinkled with pale ochreous-grey; markings fuscous; in one example a short slender streak on fold; in another a streak on base of costa; three or four minute dots in a transverse line from costa to dorsum at two-fifths, preceded by whitish; a dot on tornus, sometimes with another on four-fifths costa, and a third between them; some minute dots on termen and on costa before apex; cilia grey-whitish. Hindwings and cilia pale grey.

NORTH QUEENSLAND: Kuranda in September; Dunk I. in May. QUEENSLAND: Brisbane in January, April, and May; Rosewood in September. Eight specimens.

BLASTOBASIS SCOTIA n.sp.

σκοτιος, dusky.

♂ ♀, 13–16 mm. Head and thorax pale ochreous. Palpi greyish-brown; in male stout, apex obtuse, fuscous; in female slender, acute. Antennae grey; ciliations in male one-half. Abdomen grey; apices of segments and tuft ochreous-whitish. Legs fuscous. Forewings moderate, costa straight to three-fourths, thence arched, apex pointed, termen very oblique; pale brownish-ochreous with slight fuscous irroration; markings fuscous; a triangular mark on base of costa; a dot on one-third costa and some suffusion between this and dorsum; a dot on tornus, another above it, and sometimes a third on costa; these may coalesce; more or less distinct dots on termen and apical part of costa; cilia pale grey. Hindwings and cilia pale grey.

NORTH QUEENSLAND: Townsville in August; Ayr, Home Hill, and Bowen in June; Mackay in August. QUEENSLAND: Brisbane in December, March, and May. Ten specimens.

BLASTOBASIS TANYPTERA n.sp.

τανυπτερος, long-winged.

♂ ♀, 18–20 mm. Head and thorax grey. Palpi in male stout, tolerably pointed, fuscous; in female slender, acute, grey. Antennae

grey; ciliations in male minute. Abdomen pale grey. Legs fuscous. Forewings narrow, lanceolate, costa straight, apex acute; whitish thickly sprinkled with grey; markings fuscous; a dot above and another beneath fold; a narrow outwardly curved fascia at two-fifths; some minute marginal dots around apex; a larger dot on mid-termen; cilia pale grey. Hindwings pale grey; cilia pale grey becoming whitish towards tornus.

NORTH QUEENSLAND: Lake Barrine (Atherton Tableland): two examples from fruits of *Eugenia paniculata* in August.

BLASTOBASIS MESOMOCHLA n.sp.

μεσομοχλος, with median bar.

♂, 16 mm. Head and thorax dark fuscous. Palpi stout, tolerably pointed; dark fuscous. Antennae fuscous; ciliations in male minute. Abdomen grey. Legs fuscous. Forewings narrow, costa nearly straight, apex obtuse; fuscous; markings blackish; a median longitudinal bar from one-third to three-fifths; a median dot at three-fourths; minute marginal dots around apex; cilia grey, around apex fuscous. Hindwings and cilia grey.

SOUTH AUSTRALIA: Adelaide in November; one specimen received from Mr. J. O. Wilson.

BLASTOBASIS CELAENEPHES n.sp.

κελαινεφης, darkly clouded.

♂, 14 mm. Head and thorax fuscous. Palpi rather stout, grey with four fuscous rings on second joint; terminal joint very short, rather acute. Antennae fuscous; ciliations in male minute. Abdomen grey. Legs fuscous. Forewings narrow, costa straight to three-fourths, thence arched, apex pointed; grey sprinkled with brownish and fuscous; markings blackish; an obscure double transverse line at one-fifth; median dots at one-half and before apex; a costal dot at one-third; a short median dash before apex; minute pale dots around apex; cilia grey. Hindwings and cilia grey-whitish.

QUEENSLAND: McPherson Range (4000 ft.) in November; one specimen.

BLASTOBASIS LEUCOCHYTA n.sp.

λευκοχυτος, suffused with white.

♂, 10 mm. Head, thorax, and abdomen fuscous. Palpi slender, tolerably acute; fuscous. Antennae fuscous; in male simple. Legs pale grey; anterior pair fuscous. Forewings narrow, costa slightly arched, apex pointed; grey; a short slender median white streak from base; a white costal dot at one-fourth, followed by a fuscous dot; two suffused white dots, beneath middle at one-third and subdorsal at middle, variable in size; a white-margined fuscous dot at three-fourths; a white dot at apex and two on termen; cilia grey. Hindwings and cilia grey. Exceptional in the slender male palpi.

QUEENSLAND: Tweed Hds. in May; one specimen.

BLASTOBASIS PHAEOPASTA n.sp.

φαιοπαστος, darkly sprinkled.

♂, 17 mm. Head and thorax fuscous. Palpi stout, obtuse; fuscous. Antennae fuscous; ciliations in male minute. Abdomen grey. Legs fuscous with whitish rings. Forewings with costa straight to near apex, apex obtuse, termen oblique; grey sprinkled with fuscous; markings fuscous, a spot on base of costa; a transverse suffusion at two-fifths; a transverse subapical line; minute elongate marginal dots around apex; cilia pale grey. Hindwing and cilia grey-whitish.

NORTH QUEENSLAND: Mackay in October; one specimen.

BLASTOBASIS PENTASTICTA n.sp.

πενταστικτος, five-spotted.

♂, 10 mm. Head ochreous-whitish. Palpi stout, obtuse, whitish. Antennae grey; in male simple. Thorax fuscous; tegulae ochreous-whitish. (Abdomen missing). Forewings with costa straight, apex obtuse, termen extremely oblique; ochreous-whitish slightly sprinkled with fuscous and with fuscous dots; a dot on base of costa, a discal dot at one-fifth, and another just before it on fold; a dot on four-fifths costa; a median dot, and a third on termen in a line with the preceding; cilia whitish. Hindwings and cilia whitish.

NEW SOUTH WALES: Sydney in February; one specimen.

Gen. EXAPATETER nov.

ἐξαπατητηρ, deceitful.

Palpi moderately long, ascending, recurved; second joint reaching base of antennae, moderately stout, rough-scaled anteriorly; terminal joint stout, acute. Antennae without basal pecten; in male shortly ciliated. Anterior tibiae smooth, short, and broad. Forewings with 2, 3, 4 approximated from angle, 7 separate, 8 to termen, approximated at origin to 9, 9 and 10 stalked from end of cell, 11 from well before middle. Hindwings elongate-ovate; cell long and produced at lower angle; 3 and 4 approximated, 5 from middle, 6 and 7 remote, parallel. Very different from any other genus.

EXAPATETER EPIERANA n.sp.

ἐπιηρανος, pleasing.

♂, 17–19 mm. ♀ 21–24 mm. Head and thorax purple-brown. Palpi with terminal joint three-fifths; whitish sprinkled with brown. Antennae brown; ciliations in male one-half. Abdomen pale ochreous. Legs pale ochreous; anterior tibiae and tarsi sprinkled with brown. Forewings suboblong; costa slightly arched, apex rectangular, termen straight, not oblique; reddish-brown; a pale dot in disc at one-third; in male a broad defined white costal crescent extending almost from base to apex; in female this area is pale orange-brown, undefined, and only its costal edge is white; terminal edge except extremities narrowly white. Hindwings and cilia grey-brown.

NORTH QUEENSLAND: Cape York in June, October, and November; eight specimens received from Mr. W. B. Barnard. Type in Queensland Museum.

Fam. GRACILARIADAE.**LITHOCOLLETIS AGRAPHA n.sp.**

ἀγραφος, without marking.

♂, 8-9 mm. Head and thorax glossy fuscous. Palpi and antennae fuscous. Abdomen and legs fuscous. Forewings narrow-lanceolate, costa straight to near apex, apex pointed; glossy fuscous without marking; cilia fuscous. Hindwings linear-lanceolate; fuscous; cilia fuscous.

QUEENSLAND: Milmeran in September; three specimens.

LITHOCOLLETIS SCYTHRODES n.sp.

σκυθρωδης, gloomy.

♂, 6 mm. Head, palpi, antennae, thorax, abdomen, and legs fuscous. Forewings narrow, costa slightly arched, apex rounded; whitish sprinkled and marked with fuscous; a basal patch; a semioval spot on midcosta; another at three-fourths; and a third smaller at apex; cilia fuscous. Hindwings linear-lanceolate; fuscous; cilia grey.

SOUTH AUSTRALIA: Mt. Lofty in February; one specimen.

PHYLLOCNISTIS NYMPHIDIA n.sp.

νυμφιδιος, bridal.

♂, 5 mm. Head, palpi, antennae, thorax, abdomen, and legs white. Forewings narrow, costa slightly arched, apex rounded; shining white; a very short fine blackish oblique streak from costa at two-thirds; a rather more pronounced streak from dorsum at three-fourths; a blackish apical dot; cilia white with two slender fuscous lines before apex. Hindwings linear-lanceolate; white; cilia white. Distinguished by its small size, absence of colour and scanty short blackish markings.

NORTH QUEENSLAND: Dunk I. in May; one specimen.

PHYLLOCNISTIS DICHOTOMA n.sp.

διχοτομος, cut in two.

♀, 4 mm. Head, palpi, antennae, thorax, abdomen, and legs white. Forewings with costa straight to two-thirds, thence arched, apex rounded; shining white; a short oblique fuscous streak from midcosta; a fine fuscous transverse line from two-thirds costa to two thirds dorsum; a blackish apical dot; a very short transverse fuscous line near apex; cilia white with a fine transverse fuscous line near apex, on apical dot blackish.

NORTH QUEENSLAND: Kuranda and Atherton in June; two specimens.

PHYLLOCNISTIS SPILOTA n.sp.

σπιλωτος, speckled.

♂, 6 mm. Head white. Palpi white; outer surface with subbasal, median, and subapical fuscous bars. Antennae grey. Thorax and abdomen pale ochreous. Legs grey with white rings. Forewings with costa nearly straight, apex rounded; pale ochreous sprinkled with

fuscous and speckled with dark fuscous dots ; a dot on one-third dorsum, a second beneath midcosta, and a third in disc at three-fourths ; a terminal series of dots ; cilia pale ochreous. Hindwings linear-lanceolate ; whitish-grey ; cilia whitish-grey.

QUEENSLAND : Toowoomba in October ; one specimen.

PHYLLOCNISTIS ZOPHOSEMA n.sp.

ζοφοσημος, with dark markings.

♂, 6 mm. Head white. Palpi white, external surface sprinkled with fuscous. Antennae, thorax, and abdomen grey. Legs white with fuscous rings. Forewings with costa straight, apex pointed ; white with fuscous markings ; fine costal, median, and subdorsal lines from base to one-third ; a broad transverse fascia beyond middle ; a short irregular longitudinal streak running to apex ; cilia on costa and apex white, on dorsum grey. Hindwings linear-lanceolate ; grey ; cilia grey.

TASMANIA : Mt. Wellington (2,500 ft.) in January ; one specimen.

EPICEPHALA BATHROBAPHES n.sp.

βαθροβαφης, basally suffused.

♂, 14 mm. Head, palpi, and thorax white. Antennae grey. Abdomen fuscous ; tuft white. Legs white. Forewings lanceolate, costa straight, apex rounded ; grey with a white dorsal streak from base to apex ; many narrow white blackish-edged streaks ; costal and median longitudinal streaks from base to two-fifths ; two oblique streaks from costa, at middle and three-fourths ; three heavily margined oblique streaks from dorsum at middle, five-eighths, and three-fourths, a curved transverse line from costa to tornus ; a blackish terminal line preceded by a blackish subterminal dot ; cilia white with blackish apices, on dorsum grey. Hindwings linear-lanceolate ; grey ; basal half in male blackish. Very distinct. The blackish suffusion on hindwings is similar to that of the male of *E. lomographa*, but in that species it is apical.

QUEENSLAND : Toowoomba in November (W. B. Barnard) ; one specimen.

EPICEPHALA ACINACEPHORA n.sp.

ἀκινάκεφορος, wearing a sword.

♂, 11 mm. Head, palpi, and thorax white. Antennae, abdomen, and tuft grey. Legs grey ; middle and posterior tibiae white. Forewings lanceolate, costa arched beyond middle, apex pointed ; grey ; suffused whitish costal and dorsal streaks from base to two-thirds ; a sharply defined curved white line from tornus to apex ; a blackish terminal line ; cilia grey. Hindwings linear-lanceolate ; grey ; cilia grey. Unusually distinct.

QUEENSLAND : Toowoomba in September (W. B. Barnard) ; one specimen.

EPICEPHALA SPUMOSA n.sp.

spumousus, foaming.

♀, 11 mm. Head and thorax pale ochreous. Palpi whitish. Antennae and abdomen grey. Legs ochreous-whitish. Forewings with

costa nearly straight, apex rounded ; whitish suffused with pale ochreous-grey ; a whitish costal streak from base to one-third ; suffused outwardly oblique streaks from costa at middle and two-thirds ; separated by short slender fuscous streaks ; a blackish apical dot partly outlined with pale ochreous ; cilia white with blackish median line.

QUEENSLAND : Stradbroke I. in August ; one specimen.

ACROCERCOPS ARGYROSEMA n.sp.

ἀργυροσημος, with silvery markings.

♀, 8 mm. Head whitish-ochreous. Palpi whitish. Antennae whitish with fuscous annulations. Thorax and abdomen white. Legs whitish. Forewings with costa slightly arched, apex pointed ; pale grey ; a broad silvery-white sub-basal fascia ; a broad semioval silvery-white spot at two-thirds, nearly reaching costa, narrowly produced on dorsum to near apex ; a slender obliquely transverse subapical line edged blackish posteriorly ; cilia grey. Hindwings linear-lanceolate ; grey ; cilia grey.

QUEENSLAND : Yeppoon in October ; one specimen.

ACROCERCOPS EURYSHEMA n.sp.

εὐρυσημος, with straight pattern.

♂, 9 mm. Head, palpi, and thorax white. Antennae grey, towards base white. (Abdomen missing). Forewings with costa slightly arched, apex rounded ; greyish-brown ; a white subdorsal line from base almost to apex, wider anteriorly ; a slender white costal line from one-third almost to apex ; a blackish apical dot ; cilia on costa white, on apex blackish, on dorsum grey. Hindwings narrow-lanceolate ; grey ; cilia grey.

NORTH QUEENSLAND : Ravenshoe (Atherton Tableland) in September ; one specimen.

ACROCERCOPS PERATOCAPNA n.sp.

περατοκαπνος, dark at the apex.

♀, 7 mm. Head, palpi, and thorax white. Antennae white with fuscous annulations. Abdomen fuscous. Legs fuscous with whitish rings. Forewings with costa slightly arched, apex pointed ; grey ; a white dorsal line from base to three-fourths, with a slight prominence at one-fourth ; a short blackish line on costa extending to apex ; cilia on costa blackish, on apex white with blackish median bar, on dorsum grey. Hindwings narrow-lanceolate ; grey ; cilia grey.

NORTH QUEENSLAND : Kuranda in June ; one specimen.

ACROCERCOPS CANDIDA n.sp.

candidus, shining white.

♂, 6 mm. Head, palpi, thorax, and abdomen white. Antennae white with pale grey annulations. Legs white ; middle tibiae and tarsi with fuscous rings. Forewings with costa slightly arched, apex pointed ;

shining white; faint grey transverse fasciae at one-fourth, middle, and three-fourths; cilia white. Hindwings narrow-lanceolate; white; cilia white.

QUEENSLAND: Toowoomba in April; one specimen.

ACROCERCOPS ALBIDA n.sp.

albidus, whitish.

♀, 7 mm. Head, palpi, thorax, abdomen, and legs whitish. Antennae whitish with fuscous annulations. Forewings with costa straight, apex acute, acuminate from three-fourths; whitish with a few blackish points; cilia whitish. Hindwings linear-lanceolate; whitish; cilia whitish.

QUEENSLAND: Brisbane in August; one specimen.

PARECTOPA RHICNODES n.sp.

ῥικνωδης, shrivelled.

♂, 11 mm. Head pale greyish-ochreous; face white. Palpi white with fuscous rings on apex of second, and base and apex of terminal joint. Antennae pale greyish-ochreous, towards apex with fuscous annulations. Abdomen fuscous; basal segments grey; tuft pale ochreous. Legs whitish with fuscous rings. Forewings narrow, costa straight, apex rounded; pale greyish-ochreous sprinkled with fuscous; some blackish dots on costa and dorsum near apex; an apical blackish dot; cilia on costa and apex pale greyish-ochreous, on dorsum grey. Hindwings linear; grey; cilia grey.

QUEENSLAND: Brisbane in October; one specimen.

PARECTOPA STICTOCROSSA n.sp.

στικτοκροσσος, with dotted edge.

♂, 10 mm. Head and thorax brassy. Palpi whitish; apex of terminal joint fuscous. Antennae fuscous. (Abdomen missing). Forewings with costa slightly arched, apex rounded; ochreous-brown; a series of blackish costal dots from base to near apex; cilia brown with blackish apices, on dorsum grey. Hindwings lanceolate; grey; cilia grey.

QUEENSLAND: Carnarvon Range in March; one specimen received from Mr. N. Geary.

T. L. BANCROFT MEMORIAL LECTURE.

THOMAS LANE BANCROFT, Pharmacologist.

By H. J. G. HINES, B.Sc., Department of Physiology,
University of Queensland.*(Delivered before the Royal Society of Queensland, 26th November,
1945; issued separately, 20th January, 1947.)*

Last year your Council invited Mr. C. T. White to deliver a memorial address on the life and work of Mr. Henry Tryon. The present Council decided that a memorial address might well be a recurring feature of the Society's programme, and as a result I am to speak to you to-night on certain aspects of the work of one of our former distinguished life-members, Dr. T. L. Bancroft.

Thomas Lane Bancroft died on 12th November, 1933; as is customary, his death was noted by our then President previous to his presidential address of the following year, but nothing was said of his work. However, an adequate notice of his life appeared in the Medical Journal of Australia for April, 1934. It is not my purpose to-night to attempt anything approaching a full biographical memoir. Had I been qualified to do so I could have spoken of Bancroft's work as an entomologist, as a parasitologist, or in reference to public health. In all of these branches of science he made considerable contributions to our knowledge, and we cannot in these days of specialism fail to be impressed with his versatility.

T. L. Bancroft was fortunate in his early upbringing. The scientific prowess of his father, Joseph Bancroft, is well known; his discoveries are now classics and his name is commemorated in Brisbane annually by a memorial lecture delivered under a foundation of the British Medical Association. Joseph Bancroft himself had made some notable pharmacological discoveries, which are recorded in the earliest numbers of our Proceedings. These deal with the active constituent of pituri and with the mydriatic properties of *Duboisia myoporoides*. This latter plant has proved to be of outstanding importance. Hyoscine is the most efficacious prophylactic known against sea- and air-sickness; and the safe landing in fit condition of thousands of troops in sea- and airborne invasions has been made possible through the extensive use of this drug, which has been practically all supplied from the eastern coastal districts of Australia. As a boy, T. L. Bancroft must have assisted his father in these botanical and pharmacological investigations, and it is not surprising that, when his turn came to take up the study of medicine at Edinburgh, the home of so many great naturalists, he should have won the bronze medal for botany.

Bancroft returned to Queensland in 1885 and, from then until the time of his marriage ten years later, he was actively interested in the pharmacology of the local flora. A short period of residence at Christchurch gave him the opportunity to become acquainted with the New Zealand flora and to test the properties of some of its species. He published the results of his enquiries in a series of short papers which appeared for the most part in our Proceedings but also in those of the

Royal and Linnean Societies of New South Wales. His purpose was to make as thorough a survey as possible. His methods were simple. To quote his own words:—

“The method which I followed in selecting plants for examination was based on the fact that most of the active known drugs are bitter, and consisted in tasting the bark, or occasionally other parts of the plant, when if these were found bitter, acrid or pungent, a certain amount of the plant was collected for experiments.” “About a thousand plants were so examined and a large proportion were astringent. One hundred and fifty plants selected because they had some decided taste, or reputed to be poisonous, were examined as follows:—

“An extract of the dried parts was made of each by maceration in dilute alcohol, and evaporation of the tincture in the sun or over a water-bath. One to three grains of extract suspended in a few minims of water were injected under the skin of a frog; if no symptoms manifested themselves within an hour or so, the plant whose extract was under observation was considered inert.” In this way in the first three years of his work he was able to show that plants of fifteen genera—*Cryptocarya*, *Zanthoxylum*, *Daphnandra*, *Entada*, *Erythrina*, *Excaecaria*, *Flindersia*, *Hernandia*, *Harpullia*, *Acacia*, *Archidendron*, *Cerbera*, *Colocasia*, *Nicotiana*, and *Pongamia*—exhibited toxic properties.

Bancroft next examined some New Zealand plants and records two species of peculiar interest, *Laurelia Novae-Zelandiae* (the “pukatea”) and *Myoporum laetum*. His remarks on them serve to show the worth of his observations. Of the pukatea he says: “An alcoholic extract was made, which when injected into frogs caused rapid death. A few spasmodic jerks of the hind limbs were noticed before the animal became flaccid. The muscles, motor nerves and heart were apparently influenced. A solution of the extract in water gave the reactions of an alkaloid.”

In spite of this clear statement Aston was able to say in 1909: “In the annual report of the New Zealand Department of Agriculture for 1901, ‘Attention was first drawn by the author to the occurrence of alkaloids in the bark of the pukatea.’” Aston isolated three alkaloids which have been further investigated by Barger, Girandet and Schlittler. These Lauraceous and Myoporaceous alkaloids are structurally related to the alkaloids of the Fumariaceae. Of *Myoporum laetum*, Bancroft briefly remarks that preparations of this plant are poisonous, that the plant contains an oil and a wax, and that the oil, at any rate, is poisonous to frogs. The poisonous nature of the oil of the *Myoporum* species, which have long been known to be stock poisons, has recently been confirmed by observations in New Zealand and by observations on *M. acuminatum* in progress here. Earlier experimenters had failed to detect the poisonous principle, although the nature of this is clearly indicated in Bancroft’s observations. Others, however, were directly stimulated by Bancroft’s observations to carry out further chemical and pharmacological investigations. Rennie and Turner investigated *Stephania hernandiifolia* and claimed to have isolated therefrom picrotoxin, a claim which needs confirmation. They also confirmed that the plant contains an alkaloid with a strong convulsant action. Maiden and Smith worked on *Carissa ovata* var. *stolonifera* and obtained an impure cardiac glycoside which they named carissin. Some mystery is attached to this plant, as the variety *stolonifera* has never been satisfactorily

established. Further work on Bancroft's discoveries was carried out at the Wellcome Institute by Pyman and his co-workers who investigated *Fagara brachyacantha* (*Zanthoxylum brachyacanthum*) in 1913 (1- α -canadine methochloride and γ -homochelidonine), and *Daphnandra micrantha* in 1914. The *Erythrina* species including the Australian species have recently been fully investigated in Merck's American laboratories by Folkers and Unna in their search for curare-like alkaloids. But it is obvious that Bancroft's original design, the comprehensive pharmacological examination of the Queensland flora, has never been carried out and that his work has never received the attention that it deserves. There are, of course, reasons for this: in the first place his papers are not immediately impressive by present day standards. His work was carried out under great difficulty and often with no resources beyond those to be found in a country doctor's dispensary. His notes were at times hastily written and the chemistry is often crude. It is difficult to see how it could be otherwise at the time, since no skilled assistance was available locally. Interest in vegetable drugs began to wane at the turn of the century. Pharmacopeias were rigidly pruned and the number of really useful drugs was found to be relatively small. At the same time the rise of vaccine and serum therapy, of endocrines and organotherapy, and the multiplication of synthetic medicaments further detracted from the interest in plant products. The young science of pharmacology was only just beginning to find its feet.

But of recent years interest has again revived. There are several reasons for this revival. Among them we may mention: the usefulness of pharmacological methods not only as a basis for therapeutics but also to further the understanding of physiological mechanisms (the classical example being Langley's work with nicotine); the growing studies on plant poisoning of livestock; and the general recognition that there is no sharp distinction between plant and animal products, with the growing realisation of the dependence of animals on even the most obscure products of plant synthesis. It follows, therefore, that the more we know of plant products and of their actions, both acute and chronic, on animals, the better shall we be in a position to understand the metabolic activities of both.

The therapeutic interest in plant products has received tremendous impetus from the discovery of penicillin and the subsequent discovery of antibiotic substances in flowering plants. It is evident that T. L. Bancroft's plan for a thorough examination of the pharmacological properties of the Queensland flora is well worth pursuing. To that end, a number of workers, both in this State and in Melbourne, are carrying out systematic investigations under the aegis of the Commonwealth Council for Scientific and Industrial Research, and promising results have already been obtained. In other countries such work has received substantial help from pharmaceutical firms. Had a medical school been in existence in Queensland in Bancroft's time, there is no doubt that he would have taken a keen interest in the teaching of pharmacology and materia medica. At present we have no chair or lectureship in this subject. Should one become established, I feel that it might fittingly be associated with the pioneer pharmacologist we remember this evening.

During the discussion which followed, in which Mrs. Bancroft took part, it was mentioned that T. L. Bancroft was the first to discover the mode of transference of the larva of *Wuchereria bancrofti* (*Filaria*

bancrofti) from the mosquito to man. He experimented with several species as vectors, and showed that mosquitoes, if fed on fruit, could be kept alive in captivity for weeks. This work appears to have led to his wider studies of mosquitoes. His interest always lay primarily with the living insect, its habits and life history, as is shown by his detailed and accurate observations, but he was also an enthusiastic collector. Between 8th May, 1899, and 10th October, 1901, nine samples totalling over 600 mosquitoes were received at the British Museum from T. L. Bancroft, and his specimens formed the basis for Theobald's work on Australian species in "A Monograph of the Culicidae of the World." The Queensland Museum collection is composed mainly of Bancroft's specimens, and there are large numbers of them in the collections of the Macleay Museum and the School of Public Health and Tropical Medicine, Sydney. Of 48 described species of mosquitoes with type localities in Queensland, the type specimens of 25 were collected by Bancroft. In addition, he collected at least another 25 species, many being the first records for this State. He collected also in New South Wales, Victoria and Tasmania. In 1908 he published a "List of the Mosquitoes of Queensland with the Original Descriptions and notes on the Life History of a Number" (Annals of Queensland Museum, No. 8). The descriptions are taken from Theobald and others, the notes on habits, life history, eggs and larvae are Bancroft's, and much of his work has not been repeated.

T. L. Bancroft, in 1905, carried out the first transmission experimental work on dengue in Australia, and went at least half-way to proving that *Aedes aegypti* was the vector. He may justly be regarded as the father of mosquito research in Queensland, and such names as *Anopheles bancrofti* and *Aedes bancroftianus* bear tribute to his work.

In addition to his work on mosquitoes, Dr. T. L. Bancroft paid much attention to fruit flies, and many of the species described by Mr. Henry Tryon were first collected by him. He also sent a large collection of fruit flies to the British Museum, including many species not yet rediscovered. At least two species of fruit flies bear the specific name *bancrofti* in recognition of his work. As with the mosquitoes, he was more interested in the biology of the fruit flies and their relationship to native flora than in the taxonomy.

In other fields of biology T. L. Bancroft was equally enthusiastic in his pursuit of knowledge. He made numerous investigations on parasites of domestic and native animals and birds. He studied in detail the life history of the Ceratodus, and was able to rear specimens to over two years old in his aquarium.

He has set a standard in experimental biology in Queensland, which should be an inspiration to all who follow him in this field.

MISCELLANEOUS NOTES.

FOSSILIFEROUS SANDSTONE FROM CAIRNCROSS ROCKS.—Before the war-time construction of the dock, the Cairncross Rocks on the Brisbane River extended several feet above high-water mark, with banks of alluvium on either side.

They consisted of poorly bedded argillaceous sandstones slightly tilted towards the river—that is, in a northerly direction. They were backed by a low sandy knoll, which was separated from the highlands of Bulimba by a swampy belt on the site of a former channel of the river.

On lithological and stratigraphical grounds the sandstones had been relegated to the Triassic and tentatively correlated with the Bundamba sandstone, which should overlie the coal measures exposed downstream towards Doughboy Creek and on the Hamilton Hills across the river.

The dock excavations revealed that, interstratified with the generally massive sandstone, there are lenticular beds of shale, at most 2 ft. in thickness, some of which are coaly and yet almost completely non-fossiliferous; but unexpectedly the sandstones were found to be rich in plant stems and strap-like leaves, in many places massed and occasionally coalified. Mr. O. A. Jones, who is palaeobotanist to the Geological Survey, advised me that at least one of them (a *Schizoneura* ?) might be a new form.

L. C. BALL.

FOSSILS FROM THE ROCKS AT CAIRNCROSS DOCK.—At Cairncross Dock a number of the common species of the Ipswich Series were found by Mr. L. C. Ball, but most interesting was a new species probably of the genus *Schizoneura*. This was larger than any described from Mesozoic deposits anywhere in the world. Many fragments of this were found, including one with the undivided leaf sheath attached. It is probable that most of the structure of the form can be reconstructed from the specimens. The assemblage indicates that the beds are part of the Ipswich Series.

O. A. JONES.

TWO NEW SPECIES OF Equisetites.—Several specimens of two new species of *Equisetites* have been found at Brighton, near Sandgate. The material, though fragmentary, is very well preserved, and this has enabled much fine structure to be worked out, even the outlines of the cells of the epidermis of the sporangia being observed in one instance. Fertile specimens of *Equisetites* are uncommon, and the detail with which the structure of the cones and sporophylls can be worked out makes the find an important one.

J. T. WOODS.

A YELLOW PIGMENT FROM DENHAMIA PITTOSPOROIDES.—The root of *Denhamia pittosporoides* contains a yellow pigment. The properties of this latter agree with those described for celastrol, the pigment of *Celastrus scandens*, which is identical with tripterine, the pigment of *Tripterygium wilfordii* Hook. f. The powdered roots of the latter plant have been used in China for centuries as an insecticide (J. Amer. Chem. Soc., 1942, 64, 182).

H. J. G. HINES.

The Royal Society of Queensland.

Report of Council for 1944.

To the Members of the Royal Society of Queensland.

Your Council has pleasure in submitting the Annual Report of the Society for the year 1944.

At Ordinary Meetings throughout the year four addresses were given, and two exhibit evenings held, while one evening was devoted to films, and another to a demonstration with short addresses. The annual Memorial Lecture was held this year in honour of Mr. H. Tryon, and was delivered by Mr. C. T. White under the title of "Henry Tryon and his place in Queensland Science." Twelve original papers were accepted for publication in the Proceedings.

It has been decided that the Society may include in the Volume each year a section devoted to Miscellaneous Scientific Notes approved by the Council. Such notes should not in general exceed half a page in length, and if separates are desired by the author he should make the subject of the note an exhibit at a meeting, when, if the Hon. Secretary is notified immediately, he may obtain copies of the abstracts.

The Chief Secretary's Department has agreed to pay a £1 for £1 subsidy for printing on papers 2, 3, 4, 5, and 7 published in Volume LV. of the Proceedings and judged of value from a governmental point of view. The Council acknowledges this subsidy with gratitude.

There are 3 honorary life members, 6 life members, 3 corresponding members, 204 ordinary members, and 8 associate members in the Society. This year the Society has lost one member by death and 3 by resignation, while 8 have been elected to ordinary membership and 4 to associate membership.

Attendance at Council meetings was as follows:—F. A. Perkins 9, H. J. Wilkinson 6, J. Bostock 9, E. W. Bick 9, M. Scott 10, I. R. Bick 7, S. T. Blake 10, M. F. Hickey 6, T. G. H. Jones 6, O. A. Jones 8, E. M. Shepherd 6, D. H. K. Lee 4, R. Pennington 8.

F. A. PERKINS, President.

MARGARET I. R. SCOTT, Hon. Secretary.

ABSTRACT OF PROCEEDINGS, 26TH MARCH, 1945.

The Annual Meeting of the Society was held in the Geology Department of the University on Monday, 26th March, 1945, at 8 p.m. The Chair was occupied by the President (Mr. F. A. Perkins). An apology was received from the Patron, His Excellency the Governor. About fifty members and friends were present. The minutes of the previous Annual Meeting were read and confirmed. The Annual Report was adopted, and the Balance-sheet received. Miss B. Baird, Miss M. Pezet, Mr. J. A. Ferguson, Mr. R. Gradwell, and Mr. J. T. Woods were nominated for Associate Membership. Mr. F. Bennett was made an Honorary Life Member. Mr. W. Boardman was nominated for Ordinary Membership.

The following officers and Council were elected for 1945:—President, Prof. H. J. Wilkinson; Vice-Presidents, Mr. F. A. Perkins and Mr. O. A. Jones; Hon. Secretary, Miss M. Scott; Hon. Treasurer, Mr. E. W. Bick; Hon. Librarian, Mr. R. Pennington; Hon. Editors, Mr. S. T. Blake and Dr. M. F. Hickey; Councillors, Prof. J. Bostock, Dr. M. White, Mr. H. J. G. Hines, Mr. S. B. Watkins, and Mr. E. M. Shepherd; Hon. Auditor, Mr. L. P. Herdsman.

The Presidential Address entitled "Mosquito Problems of Queensland" was delivered by Mr. F. A. Perkins. A vote of thanks was moved by Prof. T. G. H. Jones, seconded by Dr. D. A. Herbert, and carried by acclamation.

ABSTRACT OF PROCEEDINGS, 30TH APRIL, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 30th April, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. About thirty members and friends were present. The minutes of the previous meeting were read and confirmed. Mr. W. Boardman was elected to Ordinary Membership, and Miss B. Baird, Miss M. Pezet, Mr. J. A. Ferguson, Mr. R. Gradwell, and Mr. J. T. Woods to Associate Membership. Mrs. K. Avery, Miss Y. Tarnogurski, and Mr. N. Shaw were nominated for Ordinary Membership, and Miss E. Haylock for Associate Membership.

Mr. S. B. Watkins exhibited a fossil ammonite with the original mother of pearl layer on the outer surface and a collection of fossils, all from the Grey Ranges adjacent to the Queensland Border. The specimens were forwarded by Mr. F. F. Forster, of Tiboobuna, New South Wales.

Professor H. J. Wilkinson demonstrated a simple practical method for obtaining photomicrographs showing general features of microscopical preparations under low magnification, which compare very favourably with those obtained by the equipment necessary for the Köhler method of critical illumination. As evidence of the standard of work that could be obtained, a series of about fifty photographs of a representative variety of specimens was exhibited, including ordinary histological preparations of human tissue, whole mounts of insects and embryos, Weigert Pal preparations of the brain stem, &c.

Mr. O. A. Jones exhibited a specimen of the ammonite *Beudanticeras flindersi* found near Aramac and presented to the University by Mr. D. Wearne. The specimen is nearly complete and shows the septal sutures particularly well. It comes from the Tambo Series of Cretaceous age.

Mr. F. A. Perkins exhibited a map showing the distribution of the more important vectors of malaria in the Dutch East Indies and Burma. He dealt briefly with the habits of the larvae and adults of the following species:—*Anopheles minimus*, *A. maculatus*, *A. sundaicus*, *A. punctulatus*, *A. hyrcanus* and *A. umbrosus*.

Dr. M. White exhibited a ground glass assembly for the vacuum distillation of foaming liquids. Incorporated in the column was a patent anti-foam splash head. The receiver was a special adaptation of the Kon modification of the Perkin triangle.

On behalf of Dr. W. H. Bryan, Mr. E. V. Robinson exhibited several specimens of Staurolite from the Cloncurry district exhibiting very regularly developed cruciform twinning. Similarly twinned crystals from Virginia County, U.S.A., are popularly known as "Fairly Crosses."

Mr. E. V. Robinson exhibited a diamond-shaped specimen of Phlogopite—the diamond shape being determined by the phenomenon of secondary cleavage along gliding planes brought about by a permanent rearrangement of the internal molecular structure of the mineral due to stress. An optical mineralogical analysis reveals that it is Biaxial and negative in sign with a small axial angle $2V = 5^\circ$. Its Refractive Index is < 1.57 and it is Non pleochroic.

Mr. V. A. Weddell exhibited a life history case showing the various stages of the banana fruit-eating caterpillar, *Tiracola plagiata*. This Noctuid was recorded as a serious pest in the autumn of 1919 in certain areas. In 1927 a large scale outbreak destroyed a tremendous amount of fruit in banana plantations from Kilcoy to Gympie. In March, 1945, after a period of 18 years, the insect was again present in outbreak proportions, fortunately in a limited area just north of Dayboro.

ABSTRACT OF PROCEEDINGS, 28TH MAY, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 28th May, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. About fifty members and friends were present. The minutes of the previous meeting were read and confirmed. Mrs. K. Avery, Miss Y. Tarnogurski and Mr. N. Shaw were elected to Ordinary Membership. Miss M. Grice and Mr. T. Whalley were nominated for Ordinary Membership.

A symposium on "Detoxication Mechanisms" was held. In opening the symposium, Dr. White stressed the importance of using the term detoxication in an unrestricted sense. For example, *Aspergillus niger* converted sodium telluride to dimethyl telluride (cultures showing this reaction were exhibited), and this might be regarded as micro-organism detoxication. The conversion of benzoic acid to hippuric acid by bovines was an example of detoxication by higher forms of life. The

main defences used against abnormal molecular configurations in the diet of all animals were oxidation, reduction, conjugation. Sometimes combinations of two or more methods were used. For example, nitro benzaldehyde had the nitro group reduced to an amino group and the aldehyde to acid which finally conjugated with glycine. The method of administration, the amount used and the frequency of treatment all influence the type of metabolite produced and it is therefore important in all detoxication studies first to define the conditions of the tests accurately.

Mr. H. J. G. Hines dealt with detoxication mechanisms in man. He said that detoxication as ordinarily understood was called into play to deal with:—(a) what might be called ordinary or normal substances occurring in the food or produced in the intestine and (b) extraordinary substances introduced as drugs or encountered by reason of the subject's occupation. These latter often called for special studies and he gave some recent examples of such investigations. Added point had been given to the study of the detoxication of aromatic hydrocarbons since their carcinogenic properties had been discovered. Detoxication is largely brought about by the liver and the hippuric acid conjugation test is now extensively used as a test of liver function.

Mr. S. Wright stated that the detoxication mechanisms used by herbivora conform with the more modern theories which assert that detoxication is to be regarded, not as a special branch of metabolism provoked to action when foreign molecules enter the body, but as part of the process leading to complete oxidation. The view is taken that the detoxified substances isolated from the urine are the portions of the metabolite which have escaped oxidations only because of the rapidity of excretion. To support this view the methods used by the rabbit in detoxifying vanillin, and by the rabbit and the sheep in detoxifying menthol and phellandrene were discussed. Comparisons were made between the methods used by the rabbit in detoxifying citral and citronellal, the latter probably undergoing cyclisation in the stomach. The recent work dealing with the excretion of selenium from selenised-animals following administrations of brom-benzene was discussed.

ABSTRACT OF PROCEEDINGS, 25TH JUNE, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 25th June, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. About fifty members and friends were present. The minutes of the previous meeting were read and confirmed. Miss M. Grice, and Mr. T. Whalley were elected to Ordinary Membership. Mr. I. F. B. Common was proposed for Ordinary Membership.

Mr. H. J. G. Hines exhibited the root of *Denhamia pittosporoides* and a specimen of the pigment extracted from it. The properties of this latter agree with those described for celastrol, the pigment of *Celastrus scandens*, which is identical with tripterine, the pigment of *Tripterygium wilfordii* Hook f. The powdered roots of the latter plant have been used in China for centuries as an insecticide (J. Amer. Chem. Soc., 1942, 64, 182).

A symposium on "The Atherton Tableland" was held. Mr. A. K. Denmead discussed the geology of the district. He stated that the Atherton Tableland, with an area of some 300,000 acres and an altitude of 1,500 to 2,500 feet, is a region of undulating country with volcanic hills rising 600 feet above the general level. Its origin is thought to be due to a vertical uplift (the Kosciusco Uplift) at the close of the Tertiary period, the surface having previously been reduced to a state of pene-plantation. The scarps at the eastern edge of the Tableland are believed to be due to faulting. The geological formations of the Tableland are (1) The Barron River Series, comprising strongly folded schists, slates and greywackes of probably pre-Silurian age. (2) Granite and associated dykes which are intrusive into the Barron River schists. (3) A thin lacustrine deposit consisting of silt, sandstone and gravel. (4) A roughly horizontal basalt sheet overlying (3), and (5) volcanic cinders which occur in the vicinity of craters. This phase of volcanic activity is considered to be of quite recent date. Some of the craters are filled with water and are known as the Crater Lakes, such as Lake Barrine. Gold, tin, and ores of tungsten occur in lode in the Barron River schists and in the granite, while alluvial deposits containing gold and tin are found in existing watercourses and in the lacustrine deposits that underlie the basalt.

Mr. S. T. Blake, in discussing the botany of the district, said that on the relatively small area of the Atherton Tableland there is to be found quite a range of climate, soils, and vegetation-types. The rainfall varies from a yearly average of 35 inches falling almost entirely in summer to an average of about 150 inches without any pronounced dry season. Although situated between approximately 17 degrees and 17½ degrees south latitude, frosts occur in some of the areas which have been cleared of timber. For the most part the soils are either podsol or red loams or modifications thereof. Open forests are found on areas where the rainfall is about 35-50 inches and where there is a pronounced dry season. The forests are dominated by Myrtaceae, chiefly *Eucalyptus* spp. with abundant grass on the ground. In the drier parts the trees rarely exceed 30 feet in height, are rather widely spaced, and are often crooked with open crowns. Several small, often partly deciduous trees are associated. The grasses tend to be tall, *Heteropogon triticeus* attaining 8-10 feet when in flower. Communities of *Melaleuca* spp. replace the eucalypts on sandy ill-drained soil; the associated grasses are lower and more frequently annual. In the wetter parts the forest is much denser and taller and the grasses rather lower with broader leaves; the floristic composition is different. Herbaceous plants other than grasses and underscrubs occur in all types. Rain-forests at one time covered large continuous areas, but to-day they are rather fragmentary. They occupied areas with a yearly average rainfall of about 60 inches and upwards, usually without a pronounced dry season. These rain-forests have the usual characteristics of such communities. They attain a height of 90-100 feet and are higher than the lowland forests and have, on the whole, larger leaves than extra-tropical communities. The young foliage is often brightly coloured. One peculiarity is the tendency shown by some trees and shrubs to produce aerial roots from the trunks and by the latter from the branches. These forests have a number of species not known elsewhere, but there are also to be found many widely distributed plants. Many valuable cabinet timbers are cut from the area. Large areas have been denuded of forest to make way for artificial pasture and the cultivation of crops.

Mr. E. C. Tommerup gave an account of the soils and agriculture of the Atherton Tableland, which was illustrated by pictures. After briefly reviewing the tobacco areas at Mareeba and Dimbulah, he passed on to a discussion of the soil problems of the Atherton maize and dairy pasture zones. Those red soils which are near neutral in reaction are fertile and show no response to any mineral fertiliser. After many years of continuous maize cropping they show a small response to some break in the maize continuity. The red soils which are acid, p H below 5.5, frequently show a response to applications of superphosphate and to lime, but not to rock phosphate. If they are very acid, p H less than 5.0, they may also respond to potash and magnesium fertiliser. Cowpea is a good indicator of potash deficiency; soils lacking potash grow cowpeas whose leaves are curved, crinkled and carry necrotic spots. Soil analyses indicate that as the p H value falls the amount of exchangeable Ca, K and Mg diminish to deficient levels. The phosphate is present in the red soils but is unavailable at p H 5.3 and higher acidity levels. It is in these acid soils that the White Grub (*Lepidiota caudata* larvae) does its damage to the *Paspalum dilatatum* pastures, vide J. H. Smith, Queensland Agricultural Journal, October, 1936, and D. O. Atherton, Queensland Agricultural Journal, November, 1939. In general, the acidity of the soils increases as one travels from the 50 inches isohyet at Atherton to the 100 inches isohyet at Millaa Millaa, but there are some notable exceptions which seem to be most logically explained by the assumption that these soils were produced during a past climate which was more humid than the present. The more recent volcanic rocks produce chernozemic rather than lateritic soils. The lecturer then described some experiments on pasture improvement species during which it was found that local surviving plants of lucerne (*Medicago sativa*) and white clover (*Trifolium repens*) were very superior types with a high degree of persistence in comparison with numerous other strains and species of legumes. Unfortunately, this line of research has now been almost completely suspended.

ABSTRACT OF PROCEEDINGS, 30TH JULY, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 30th July, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. About thirty members and friends were present. The minutes of the previous meeting were read and confirmed. Mr. I. F. B. Common was elected to Ordinary Membership. Mr. F. C. Nommenson and Dr. W. J. Chamberlain were nominated for Ordinary Membership, and Mr. H. J. T. Bake for Associate Membership. On the recommendation of the Council, Dr. A. J. Turner was proposed for Honorary Life Membership, and will come up for election at the next Ordinary Meeting.

Dr. D. A. Herbert exhibited a specimen of a fungus *Exobasidium azaleae* from a plant of *Azalea indica* cultivated at Southport. This is the first Queensland record of the fungus. He also showed specimens of a smut, *Ustilago hieronymi*, from *Triodia pungens* collected by Mr. S. T. Blake near Charters Towers, and from *T. Mitchellii* collected by Mr. Allen at Cunnamulla.

Dr. White gave an address on endemic fluorosis in artesian areas of Queensland. After outlining the history of fluorosis and showing its world distribution, the events leading to its discovery in Queensland were given in some detail. A large number of specimens, showing various stages of the malady from lambs to full-mouth sheep, were exhibited. All specimens showed marked wear of molars and the definite "pitting" and banding of incisors was commonly featured. The abnormal development of incisors when animals were forced to subsist on fluoridated waters continuously, i.e., when there was no period on surface water, was well illustrated in the case of two, three, and four-year old sheep. The seriousness of this disability was stressed by reference to recent drought losses which were accentuated by the inability of affected sheep to chew old fodder stands. In some cases the pulp cavity was exposed. The lecturer indicated that when the fluorine intake of water for in-lamb ewes reached a level of 12 parts per million, there was a serious risk of the unborn lamb being affected, and this was illustrated in the case of a lamb whose deciduous teeth showed a high fluorine content and abnormalities in structure. A number of specimens showed exostoses which develop when the fluorine level in the water exceeded 2 parts per million. Interest was added to the lecture by the use of an ultra-violet lamp (mercury vapour) which delineated the affected areas in bones quite well by a marked fluorescence.

A lengthy discussion followed, in which Dr. Carter, Medical Officer in one of the affected areas, gave his clinical findings. Dr. Carter had tendered a large selection of human teeth taken from patients in the endemic zone, and these were a source of interest to a number of medical officers present. Others who joined in the discussion were Professor Wilkinson, Dr. Roberts, Mr. Ogilvie, Mr. Hines, and Dr. Hickey.

ABSTRACT OF PROCEEDINGS, 27TH AUGUST, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 27th August, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. About thirty members and friends were present. The minutes of the previous meeting were read and confirmed. Mr. F. C. Nommensen and Dr. W. J. Chamberlain were elected to Ordinary Membership, and Mr. H. J. T. Bake to Associate Membership. Mr. A. Millingen was nominated for Ordinary Membership.

Dr. A. Jefferis Turner was elected to Honorary Life Membership. Dr. Turner arrived in Brisbane in 1889, and since then has collected and studied Lepidoptera all over Australia. His first paper was published in 1894, and dealt with the description of Micro-Lepidoptera from Moreton Bay. From then on, he has been a regular contributor to all scientific journals of Australia, and, in all, has published over one hundred articles. Undoubtedly, he is the world's authority on the Lepidoptera of Australia. He has devoted particular attention on that difficult group known as the "Micro-Lepidoptera" and such big families as Oecophoridae. Dr. Turner has also been a trustee of the Society for many years.

Mr. L. C. Ball briefly described the geological conditions at Cairncross Dock on the Brisbane River, and exhibited fossil plants collected by him during excavation.

Mr. O. A. Jones spoke of the fossils collected by Mr. Ball. A number of the common species of the Ipswich Series were found, but most interesting was a new species probably of the genus *Schizoneura*. This was larger than any described from Mesozoic deposits anywhere in the world. Many fragments of this were found, including one with the undivided leaf sheath attached. It is probable that most of the structure of the form can be reconstructed from the specimens. The assemblage indicates that the beds are part of the Ipswich Series.

Mr. J. T. Woods exhibited several specimens of two new species of *Equisetites* from Brighton, near Sandgate. The material, though fragmentary, is very well preserved, and this has enabled much fine structure to be worked out, even the outlines of the cells of the epidermis of the sporangia being observed in one instance. Fertile specimens of *Equisetites* are uncommon, and the detail with which the structure of the cones and sporophylls can be worked out makes the find an important one.

Dr. H. I. Jensen gave an address on the Origin and Distribution of Mica in Northern Australia. He first outlined the nature and composition of the various classes of mica. Thereafter he gave the properties and more common uses of the commercial micas. The mode of occurrence of phlogopite in Central Australia was fully described, and its origin was attributed to alteration of olivine in an ultrabasic dyke by potassic solutions from later pegmatite and aplite intrusions. The occurrence of large books of muscovite in certain very coarse pegmatitic dykes of acid nature, was fully described. As regards the origin of large books of muscovite it was shown that pneumatolytic pegmatites crystallise in the same way as water solutions under high temperature and pressure, and the sequence of crystallisation of the minerals in them is entirely different from that which obtains in muscovite granite. The sequence of consolidation in the mica-bearing pegmatites is (1) the quartz of the massive quartz blows, (2) a eutectic of graphic quartz and felspar, (3) massive felspar, (4) an aggregate of crystals of quartz, felspar and mica, and (5) lastly muscovite books and glassy quartz. The reasons for this aberrant mode of crystallisation are the presence, in the mother-liquor which forms the pegmatite, of abundant water and carbon dioxide gas. The escape of much of the gas into fissures causes the early precipitation of much of the quartz in solution. After that the sequence of crystallisation is governed by the following factors:—(a) Specific gravity, (b) formula-volume, (c) oxide volume, (d) molecular volume, (e) pressure, (f) temperature, and (g) stress. Potash, being the alkali oxide with the highest oxide volume, enters into combination later than the other alkali oxides, in fact, last. It is still in solution when the zones of the earth's crust intruded has cooled sufficiently to come into the zone of stress, for which reason, together with the presence of water, mica, a hydrous stress mineral forms in preference to orthoclase. The potassic solutions corrode and absorb earlier-formed felspar to form mica and quartz, if sufficient alumina is not present in the residual magma. Various mica mines in the Territory were described and the future of mica mining was also touched on.

ABSTRACT OF PROCEEDINGS, 24TH SEPTEMBER, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 24th September, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. Thirty-three members and friends were present. The minutes of the previous meeting were read and confirmed. Mr. A. Millingen was elected to Ordinary Membership, and Mr. R. Riek, Mr. O. T. Fenwick and Dr. S. Julius were nominated for Ordinary Membership.

A paper on "A Marine Early Cretaceous Fauna from Stanwell (Rockhampton district)" by F. W. Whitehouse, D.Sc., Ph.D. (Major) was read by Dr. W. H. Bryan. A small mulluscan fauna of early Cretaceous age was described from a bed at Stanwell that apparently is within the Stanwell Coal Measures. The fauna is typical of the Valanginian *Trigonia* beds of the Indo-Pacific region and, with other evidence, makes the Lower Cretaceous history of Eastern Australia very closely parallel with that of India and of East and South Africa. From this evidence it would appear that the Stanwell Coal Measures are later than has been thought, being equivalent to the Blythesdale (pre-Aptian Cretaceous) and not Walloon (mid to late Jurassic) Series. This is not at variance with the floral evidence.

A symposium on "Potability of Water" was held. The first speaker, Mr. C. Ogilvie, traced ground water through its course, stressing the investigational importance of soaks and springs, and briefly reviewing the theory of encroachment of sea water. Typical analyses of ground waters were then considered, and reasons were put forward, based on artesian statistics, for his opinion that a substantial proportion of the chlorine in ground water is of connate origin.

Dr. W. J. Chamberlain stated that modern water purification plant comprises facilities for coagulation, sedimentation, filtration, chlorination and correction of acid water. In coagulation for removal of suspended solids, adequate mixing after distribution of the applied coagulant—generally aluminium sulphate—is imperative if economical treatment is to be expected. Mixing periods of 20 to 30 minutes are essential, with velocities ranging from 0.6 to 2.0 feet per second. The sand of filter beds is not a true filter in itself, but serves as a framework upon which the actual filtering medium is imposed—in slow sand filters this medium is a natural biological growth of algae, diatoms, zoological material, &c., in rapid filters part of the "floc" formed in coagulation is carried over to film the sand. Modern practice combines ammoniation with chlorination, whereby chloramines are formed. These compounds are efficient bactericides and much more stable in water than free chlorine. By their use chlorine may be carried throughout the distribution system and after-growths of bacteria controlled. Correction against acid water is carried to the point of saturation to calcium carbonate by addition of soda ash.

Mr. C. R. von Stieglitz drew attention to the fact that the figure for total soluble solids was not a satisfactory criterion to use in assessing the quality of water for irrigation and that consideration should be given to the percentage composition of the various basic ions expressed

as milligram equivalents. The use of the formula $\frac{\text{Ca} + \text{Mg}}{\text{Na}}$ (where the bases are expressed as milligram equivalents) to assess quality was explained, and it was stated that when this ratio fell below 0.5, the

water must be regarded as unsatisfactory for irrigation, unless the total soluble solids were very low. Limiting values used in assessing water suitability for stock were also discussed and the need to consider such factors as the access of stock to green feed, &c., was stressed.

ABSTRACT OF PROCEEDINGS, 29TH OCTOBER, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 29th October, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. About forty-five members and friends were present. The minutes of the previous meeting were read and confirmed. Mr. O. T. Fenwick, Mr. R. Riek and Dr. S. Julius were elected to Ordinary Membership.

The meeting celebrated both the jubilee of the discovery of X-rays and the centenary of the birth of W. C. Röntgen. Dr. H. C. Webster, the first speaker, said that the discovery of X-rays arose from experiments with a cathode-ray tube and a fluorescent screen of barium platinocyanide. When the screen was placed near the cathode-ray tube (previously covered with black paper) it glowed when the current passed through the tube. The discovery of the penetration of tissues and of the differential absorption of bone and tissue followed almost immediately. Since Röntgen's days immense strides have been made in producing X-rays of greater intensity and penetrative power and generators of up to 100 million volts have now been constructed. Exact controllability of output is also a feature of modern equipment. The remainder of the paper was devoted to a review of the non-medical uses of X-rays. The discovery of X-ray diffraction gave rise to two fields of investigation—firstly, of the wavelengths of X-rays, and, secondly, of the structure of crystals. The first has aided in the discovery of new elements and in the identification of impurities. It has been most fruitful in providing information regarding the structure of certain parts of atoms. The second has provided information concerning heat treatment of metals, strains in castings, the structure of wool and other animal and vegetable fibres, &c. The radiography of materials has also had widespread uses, such as differentiation between lead and soda glass, detection of foreign bodies in packaged goods, examination of defective wood, fruit, &c., detection of faked pictures, and many others. The paper concluded with a warning against the dangers of use of X-rays for frivolous purposes.

Dr. Val McDowall stated that in 1895 W. C. Röntgen discovered the rays which he called X-rays, on account of their so far unknown characteristics. The first improvement to be made in the production of X-rays, the placing of the target or anode in the vacuum tube, was made by Herbert Jackson. In 1896 Dr. C. F. Marks, Brisbane, imported the first X-ray apparatus in Australia. Advances in radiography can be divided into four periods:—(1) The induction coil and gas tube period from 1896 to 1914. (2) The interrupterless transformer and hot cathode tube period, which overlapped the induction coil period, but which came into general use about 1918. (3) The period of valve rectification and mechanical interruptors was replaced by

valves somewhat similar in construction to X-ray tubes. (4) Shock-proofing of tubes and apparatus in general was the next advance. Radiology can be divided into Diagnostic and Therapeutic, each a speciality on its own. In the early stages of diagnostic radiology with low-powered X-ray machines bones only were possible, owing to long exposures. Moving organs such as the heart and lungs were possible with more rapid exposures. Invisible organs were artificially outlined by means of contrast media, introduced either directly, such as by the mouth or rectum, or by ureteral catheter. In therapeutic radiology there was a tendency generally towards higher voltages—400 to 600 K.V's now being commonly used. Then came periods of low voltage therapy, Grenz ray and contact X-ray therapy. Results of X-ray therapy have gradually improved with improving methods of measuring dosages and by means of heavier filtration, but there is still room for some improvement in results.

ABSTRACT OF PROCEEDINGS, 26TH NOVEMBER, 1945.

The Ordinary Monthly Meeting of the Society was held in the Geology Department of the University on Monday, 26th November, at 8 p.m., with the President (Prof. H. J. Wilkinson) in the chair. About twenty-five members and friends were present. The minutes of the previous meeting were read and confirmed.

A paper entitled "Contributions to the Queensland Flora, No. 9," by C. T. White, was presented by Dr. D. A. Herbert. It included descriptions of new species and records of new localities of Queensland plants.

Mr. Hines gave a short address on the pharmacological work of Thomas Lane Bancroft, a former life member of the Society. He recalled that Bancroft planned to survey as widely as possible the pharmacological properties of the Queensland flora, and in a series of papers to this and other Societies recorded the more interesting of his discoveries. His work is still being followed up and has proved the starting point for a number of investigations of considerable interest and merit. At present, under the aegis of the C.S.I.R., his original plan for a pharmacological survey is being considerably extended.

Miss E. N. Marks exhibited a collection of Queensland mosquitoes of which T. L. Bancroft had collected specimens. Of 48 described species of mosquitoes with type localities in Queensland, the type specimens of 25 were collected by Bancroft (specimens of 23 exhibited). In addition, he collected at least another 25 species (20 exhibited), many being the first records for Queensland. He collected also in New South Wales, Victoria, and Tasmania.

PUBLICATIONS RECEIVED.

The following Institutions and Societies are on our Exchange List, and their publications are hereby gratefully acknowledged. Owing to war conditions some exchanges have temporarily lapsed.

ARGENTINE—

Dereccion general de Estadistica,
Buenos Aires.
Observatorio M. Lasagna.
Universidad de Buenos Aires.
Universidad Nacional de La Plata.

AUSTRALIA—

General—

A.W.A.
Australasian Association for the
Advancement of Science.
Australasian Institute of Mining
Engineers.
Australasian Chemical Institute.
Australian Institute of Mining and
Metallurgy.
Australian Journal of Experimental
Biology and Medical Science.
Australian Science Abstracts.
Australian Veterinary Society.
Council for Scientific and Industrial
Research.
Standards Association of Australia.

Federal Government—

Commonwealth Bureau of Census and
Statistics, Canberra.
Department of Health.
Forestry Bureau.

New South Wales—

Australian Museum, Sydney.
Botanic Gardens, Sydney.
Department of Agriculture, Sydney.
Department of Fisheries, Sydney.
Department of Mines, Sydney.
Geological Survey.
Linnean Society of New South Wales.
Naturalists' Society of New South
Wales.
N.S.W. National Herbarium.
Public Library, Sydney.
Royal Society of New South Wales.
Technological Museum, Sydney.
University of Sydney.

Queensland—

Crohamhurst Observatory.
Department of Agriculture, Brisbane.
Department of Mines, Brisbane.

Government Statistician, Queensland.
North Queensland Naturalists' Club.
Queensland Museum, Brisbane.
Queensland Naturalists' Club, Bris
bane.
Queensland, University of.
Royal Geographical Society of Aus-
tralasia (Queensland), Brisbane.

South Australia—

Adelaide, University of.
Department of Mines, Adelaide.
Geological Survey, Adelaide.
Public Library, Museum and Art
Gallery, Adelaide.
Royal Geographical Society of Aus-
tralasia, Adelaide.
Royal Society of South Australia.
Royal Society of South Australia,
Field Naturalists' Section.
Waite Agricultural Research Insti-
tute.

Tasmania—

Geological Survey.
Mines Department.
Queen Victoria Museum, Launceston.
Royal Society of Tasmania.
Tasmania, University of.

Victoria—

Department of Agriculture, Mel-
bourne.
Department of Mines, Melbourne.
Field Naturalists' Club of Victoria.
Geological Survey.
McCoy Society, Melbourne.
National Museum, Melbourne.
Royal Society of Victoria.

Western Australia—

Geological Survey.
Mines Department, Perth.
Royal Society of Western Australia.

AUSTRIA—

Naturhistorisches Museum, Vienna.

BELGIUM—

Académie Royale de Belgique.
Société Royale de Botanique de
Belgique.
Société Royale Zoologique de Belgique.

BRAZIL—

- Instituto de Biologia Vegetal, Rio de Janeiro.
 Instituto Oswaldo Cruz, Rio de Janeiro.
 Government. Departamento Nacional da Producao Animal.
 Government. Servico Geologico e Mineralogico.
 Ministerio de Agricultura Industria y Comercio, Rio de Janeiro.
 Museu Paulista, Sao Paulo.
 Universidade de Sao Paulo.

CANADA—

- Department of Agriculture, Ottawa.
 Department of Mines, Ottawa.
 Geological Survey, Ottawa.
 Nova Scotian Institute of Science.
 Royal Astronomical Society of Canada.
 Royal Canadian Institute.
 Royal Society of Canada.

CEYLON—

- Ceylon Journal of Science.
 Colombo Museum.

CHILE—

- Sociedad de biologia de Concepcion.

CUBA—

- Sociedad Geografica de Cuba, Habana.
 Universidad de Habana.

CZECHOSLOVAKIA—

- Acta botannica Bohemica.
 Charles University, Prague.
 Czechoslovakian Entomological Society.
 Masarykova Universita, Brno.

DENMARK—

- The University, Copenhagen.

ESTONIA—

- Tartu University.

FINLAND—

- Societas pro fauna et flora fennica.

FRANCE—

- Marseille Faculté des Sciences.
 Montpellier, University of.
 Museum National d'Histoire naturelle, Paris.
 Société botanique de France.
 Société des Sciences naturelles de l'Ouest, Nantes.
 Société entomologique de France.
 Société française de microscopie.
 Société géologique et minéralogique de Bretagne, Rennes.
 Société scientifique de Bretagne, Rennes.
 Station Zoologique de Cette.

FORMOSA—

- Taihoku Imperial University.

GERMANY—

- Akademie der Wissenschaften, Leipzig.
 Badische Landsverein für Naturkunde.
 Bayerische Akademie der Wissenschaften, Munich.
 Botanische Garten u. Museum, Berlin.
 Deutsche Entomologische Institut.
 Deutsche Geologische Gesellschaft, Berlin.
 Deutsche Kolonial- und Uebersee Museum, Bremen.
 Gesellschaft für Erdkunde, Berlin.
 K. Leopoldinisch-Carolinische deutsche Akademie der Naturforscher, Halle.
 Museum für Naturkunde, Berlin.
 Naturhistorisch-medizinischer Vereins, Heidelberg.
 Naturhistorischer Verein der preuss. Rheinland und Westfalens, Bonn.
 Naturwissenschaftlicher Verein zu Bremen.
 Reichsamt für Wetterdienst, Berlin.
 Sächsische Akademie der Wissenschaften, Leipzig.
 Senckenbergische Bibliothek, Frankfurt a. Main.
 Zentralblatt für Bakteriologie, etc.
 Zoologisches Museum, Berlin.
 Zoologisches Museum, Hamburg.

GOLD COAST—

- Geological Survey.

GREAT BRITAIN—

- Botanical Society of Edinburgh.
 Bristol Museum and Art Gallery.
 British Museum (Natural History), London.
 Cambridge Philosophical Society.
 Conchological Society of Great Britain and Ireland, Manchester.
 Imperial Agricultural Bureaux.
 Imperial Bureau of Plant Genetics, Aberystwyth.
 Imperial Institute of Entomology, London.
 Leeds Philosophical and Literary Society.
 Manchester Literary and Philosophical Society.
 Rothamsted Experimental Station.
 Royal Botanic Gardens, Kew.
 Royal Empire Society, London.
 Royal Society of Edinburgh.
 Royal Society of London.
 Wales, University College of.

HAWAII—

Bernice Pauahi Bishop Museum, Honolulu.

HOLLAND—

K. Akademie van Wetenschappen te Amsterdam.

Royal Netherlands Academy.
Technische Hoogeschool, Delft,
University of Amsterdam.

INDIA—

Geological Survey of India.
Imperial Agricultural Research Institute, New Delhi.

IRELAND—

Royal Dublin Society.
Royal Irish Academy, Dublin.

ITALY—

R. Accademia delle Scienze dell' Istituto di Bologna.
R. Istituto superiore agrario di Bologna.
Museo civico di storia naturale, Genoa.
R. Scuola superiore d'agricoltura in Portici.
Società Toscana di Scienze Naturali, Pisa.

JAPAN—

Agricultural Chemical Society of Japan.
Japanese Journal of Zoology.
Kyoto Imperial University.
National Research Council of Japan, Tokyo.
Ohara Institut, Kurashiki.
Tokyo Bunrika Daigaku.
Tokyo Imperial University.

MEXICO—

Academia nacional de ciencias Antonio Alzate.
Instituto Geológico de Mexico.
Observatorio Meteorológico Central, Tacubaya.
Secretario de Agricultura y Fomento.

NETHERLANDS INDIES—

Jardin Botanique, Buitenzorg.
K. Naturkundige Vereeniging in Ned-Indië.

NEW ZEALAND—

Auckland Institute and Museum.
Department of Scientific and Industrial Research, Wellington.
Dominion Laboratory, Wellington.
Dominion Museum, Wellington.
Geological Survey of New Zealand.
Royal Society of New Zealand.

M

PERU—

Sociedad Geologica del Peru.

PHILIPPINES—

Bureau of Science, Manila.

POLAND—

Geological Institute, Warsaw.
Panstwowe museum zoologiczne.
Polskie Towarzystwo Przyrodników im Kopernika, Lwow.
Sociétés Savantes Polonaises.
University of Lwow.

PORTUGAL—

Academia Polytechnica, Oporto.
Instituto Botanico, Coimbra.
Sociedade Broteriana, Coimbra.

RUSSIA—

Academy of Sciences, Leningrad.
Bureau of Applied Entomology, Leningrad.
Laboratory of Palaeontology, Moscow University.
Lenin Academy of Agriculture Sciences, Leningrad.

SOUTH AFRICA—

Durban Museum, Natal.
Geological Society of South Africa, Johannesburg.
Natal Government Museum, Pietermaritzburg.
National Museum, Bloemfontein.
South African Museum, Capetown.
Transvaal Museum, Pretoria.

SPAIN—

Real Academia de Ciencias, Madrid.
Academia de Ciencias de Zaragoza.
Real Academia de Ciencias y Artes de Barcelona.
Museo de Historia Natural, Valencia.

SWEDEN—

Göteborgs K. Vetenskaps-och Vitterhets Samhället.
K. Fysiografiska Sällskapet, Lund.
Uppsala University.

SWITZERLAND—

Naturforschende Gesellschaft, Zurich.
Société de Physique et d'histoire naturelle, Genève.

TRINIDAD—

Imperial College of Tropical Agriculture.

URAGUAY—

Museo de historia natural, Montevideo.

UNITED STATES—

Academy of Natural Sciences, Philadelphia.

Academy of Science, St. Louis.

American Academy of Arts and Sciences, Boston.

American Geographical Society, New York.

American Museum of Natural History, New York.

American Philosophical Society, Philadelphia.

Arnold Arboretum, Jamaica Plains.

Boston Society of Natural Sciences.

Buffalo Society of Natural History.

California Academy of Sciences.

California, University of.

California, University of, Los Angeles.

Carnegie Institution, Washington.

Cornell University.

Federal Government—

Bureau of Standards.

Department of Agriculture.

Geological Survey.

Library of Congress.

Public Health Service.

Field Museum of Natural History, Chicago. (Now under new name.)

Florida State Geological Survey.

Harvard University.

Illinois Natural History Survey.

Illinois, University of.

Indiana Academy of Science.

Institute of Biological Research, Baltimore.

Iowa, University of.

John Crerar Library, Chicago.

Johns Hopkins University.

Kansas Academy of Science, Lawrence.

Kansas, University of.

Lloyd Library, Cincinnati.

Michigan Academy of Arts, Science, and Letters.

Michigan, University of.

Minnesota Geological Survey.

Minnesota, University of.

Missouri Botanic Garden, St. Louis.

Museum of Comparative Zoology, Harvard.

National Academy of Science, Washington.

National Research Council, Washington.

New York Academy of Sciences.

New York Zoological Society.

Ohio State University.

Portland Society of Natural History.

Puget Sound Biological Station, Seattle.

Rochester Academy of Science.

San Diego Society of Natural History.

Smithsonian Institution, Washington.

State College of Washington, Pullman.

United States National Museum, Washington.

Vanderbilt Marine Museum, Huntington.

Western Society of Engineers, Chicago.

Wisconsin Academy of Arts, Science, and Letters, Madison.

Wistar Institute of Anatomy and Biology, Philadelphia.

Yale University—

Bingham Oceanographic Laboratory.

Peabody Museum of Natural History.

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*Herbert, D. A., D.Sc.	..	..	Biology Department, University, Brisbane.
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*Jones, Owen A., M.Sc.		The University, Brisbane.
*Jones, Professor T. G. H., D.Sc., A.A.C.I.		Chemistry Department, The University, Brisbane.
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*Langdon, R. F. N., B.Agr.Sc.		The University, Brisbane.
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*Legg, J., D.V.Sc., M.R.C.V.S.		Animal Health Station, Yeerongpilly.
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Love, V. N.		85 Kintore avenue, Prospect, South Australia.
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*Marks, E. O., M.D., B.A., B.E.		101 Wickham Terrace, Brisbane.
*Marks, Miss E. N., M.Sc.		101 Wickham Terrace, Brisbane.
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